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ABSTRACT

This study examined the distinctive characteristics of colleges and universities shown to be exceptionally successful in sending underrepresented minorities on to doctoral study in science and engineering. The minorities referred to include Indian, Hispanic, and Black Americans. Primary data for the study were generated by the National Research Council (NRC) at the request of the investigators. NRC programmers extracted and rank-ordered all colleges and universities listed as baccalaureate colleges of origin of Indian, Hispanic and Black American recipients of doctorates in science and engineering for the years 1988-1993. These data came from NRC's databank of doctorate recipients. Site visits were then made to institutions listed among the top 10 when further analyzed according to group. This procedure resulted in visits to the University of Oklahoma, Oklahoma State University and Northeast Oklahoma State University for Indian recipients; Cornell University (New York), the University of California at Los Angeles and Arizona State University for Hispanic recipients and Howard University (Washington, D.C.), Morgan State University (Maryland), Hampton University (Virginia), University of Maryland and University of Maryland-Baltimore County for Black Recipients. The study concluded that some distinctive characteristics of high producers include: total commitment of the trustee board and the central administration team to the minority initiative in science and engineering; faculty members who receive a great deal of satisfaction from preparing young minority people for doctoral study; alumni or community contacts who help in recruiting students; pre-college bridge programs; campus bridge programs aimed at turning B students into A students; involving students in undergraduate research; application to programs that support minority initiatives; student mentoring; support and encouragement of campus chapters of national Science and Engineering minority organizations; support of student attendance at conferences; use of alumni role models; preparation for high scores on the Graduate Record Examination; search for assistantships and fellowships for doctoral study for graduates; annual report cards on progress and achievements of the minority initiative; and participation with other institutions, corporations, and churches in efforts to broaden the pool of minority children and youth headed to science and engineering careers. (JRH)

ED 390 645

# Distinctives of High Producers of Minority Science and Engineering Doctoral Starts

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**National Science Foundation**
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# *Distinctives of High Producers of Minority Science and Engineering Doctoral Starts*

*Marian Brazziel Associates*
*Mansfield Center, CT 06250*

## *Highlights*

*This study examined the distinctive characteristics of colleges and universities shown to be exceptionally successful in sending underrepresented minorities on to doctoral study in science and engineering. The minorities referred to include Indian, Hispanic and black Americans.*

*Primary data for the study were generated by the National Research Council at the request of the investigators. NRC programmers extracted and rank-ordered all colleges and universities listed as baccalaureate colleges of origin of Indian, Hispanic and black American recipients of doctorates in science and engineering for the years 1988-1993. These data came from NRC's databank of doctorate recipients.*

*Site visits were then made to institutions listed among the top ten when further analyzed according to group. This procedure resulted in visits to the University of Oklahoma, Oklahoma State University and Northeast Oklahoma State University for Indian recipients; Cornell University, the University of California at Los Angeles and Arizona State University for Hispanic recipients and Howard University, Morgan State University, Hampton University, University of Maryland and University of Maryland-Baltimore County for black recipients.*

*Distinctives of high producers are as follows:*

- *Total commitment of the trustee board and the central administration team to the minority initiative in science and engineering.*

- *Faculty members who receive a great deal of satisfaction from preparing young minority people for doctoral study.*

- *Alumni or community contacts who help in recruiting top-flight students.*

- *Pre-college bridge programs which eliminate gaps in knowledge and skills while students are still in high school.*

- *Campus bridge programs aimed at turning B students into A students by*

*stressing organization, time management and attitude adjustment.*

*• Utilization of every possible opportunity to involve students in undergraduate research, e.g., NIH's MARC program, NSF's RCMS program, the Hughes Corporation's bio-medical research program and AT&T's summer program for student researchers.*

*• Application to every one of the growing number of federal and foundation programs to support minority initiatives, e.g., Alliances for Minority Participation of the National Science Foundation, Minorities in Graduate Education of the U.S. Department of Education.*

*• Student mentoring of the first order.*

*• Heavy support and encouragement of campus chapters of national S&E minority organizations, e.g., AISES (American Indian Science and Engineering Society), NACME (National Action Council for Minorities in Engineering).*

*• Support of student attendance at conferences to read papers and to foster general interaction with scholars and student scholars.*

*• Heavy use of alumni role models who have received S&E doctorates and who are now making their marks.*

*• Preparation for high scores on the GRE.*

*• All-out search for assistantships and fellowships for doctoral study for graduates.*

*• Annual report cards on progress and achievements of the minority initiative.*

*• Participation with other institutions, corporations, churches et al in efforts to broaden the pool of minority children and youth headed to science and engineering careers. Most institutions now work with NSF's Alliances for Minority Participation (AMP). Some thirty of these alliances now operate and there is one near or in every minority community.*

### *About the Investigators*

*William F. Brazziel is Professor of Higher Education and Director of Graduate Programs in Higher Education at the University of Connecticut.*

*Marian E. Brazziel is Chairman and Chief Operating Officer of Marian Brazziel Associates of Mansfield Center, Connecticut.*

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# *DISTINCTIVES OF HIGH PRODUCERS OF MINORITY SCIENCE AND ENGINEERING DOCTORAL STARTS*

***William F. Brazziel***
***University of Connecticut***

***Marian E. Brazziel***
***Marian Brazziel Associates***

## *INTRODUCTION*

More and more leaders now recognize that 1) America has a problem where the continued flow of well-educated scientific and technical workers is concerned and 2) demographic shifts require better development of talents of minorities to make up for probable shortfalls in S&T and S&E workers.

Charles Vest told a conference of NSF's Young Presidential Investigators recently that we will enter the 21st century with a deficit of 700,000 science and engineering workers, and "that if somebody doesn't do something," things will get worse (Vest, 1992). Dr. Vest is president of the Massachusetts Institute of Technology. He went on to note that a combination of demography and lessened interest in studying for Ph.D. degrees in S&E places manpower for this sector at serious risk. He noted that American citizens now receive less than 44 percent of the engineering doctorates each year and less than 60 percent of doctorates in the physical sciences.

Dr. Vest called for renewed and increased interest in NSF's Minority Initiative, noting that women and minorities comprise the last reservoirs of untapped talent for S&E doctorate production. He noted that women now seem to have hit a plateau in doctoral study, with minimal changes in the ratios of doctorates received over the past few years (about 30 percent of the total). He concluded that serious attention now must be placed on talent development among minorities.

"Some college and university officials are in for a rude awakening," Patrick Crecine told

Change magazine interviewer recently, "This is especially true for those involved with science and engineering," Crecine went on. "White males, comprised 40 percent of the population in 1990 but this figure will drop to less than 30 percent in the year 2000," he said. "Minority kids and their development thus become hugely important to the success of this country to compete in global markets," Crecine continued. Dr. Crecine is president of Georgia Technological University.

Vest is certainly correct about a reservoir of undeveloped talent among minority groups and Crecine is surely right about the urgency of developing this talent. While these groups comprise roughly 20 percent of the doctorate-age population (ages 30-34), they comprise less than 10 percent of S&E doctorate recipients (National Research Council, 1991). When Asians are excluded from the total, the remaining minorities, i.e., blacks, Hispanics, and Indians, the focus of this study, received only 831 doctorates in science and engineering in 1990, barely five percent of the 15,900 awarded American citizens during that year. This suggests ample room for improvement and identifies a fine source for making up the shortfalls in S&E manpower in the years to come. The listings of doctoral recipients below offer further insight. The data were taken from Science and Engineering Indicators, 1991, a National Science Board publication. S&E Doctorate Production Among Minorities: 1990.

| | |
|---|---|
| • Indians | 40 |
| • Blacks | 340 |
| • Hispanics | 451 |
| Total S&E Doctorate Recipients | 831 |

Percent of Total S&E Doctorate Production Among U.S. Citizens (N = 15,900) = 5.0.

A 1993 report from the National Science Foundation (Hill, 1993) contains more encouraging figures but gaps still remain. The data are as follows:

| | |
|---|---|
| • Indians | 41 |
| • Blacks | 452 |
| • Hispanics | 536 |
| Total Minority Doctorate Recipients | 1029 |

NSF has mounted an imaginative Minority Initiative designed to bring more minorities into doctoral study. Grants have been awarded colleges, universities and other institutions for science camps, young scholars programs and similar entities designed to mentor young minority students into science and engineering, and perhaps into Ph.D. study in these fields. The U.S. Department of Education has programs designed to afford laboratory summer experiences to undergraduates in the hope that more will go on to the Ph.D.

While these programs and the renewed interest in the problem are laudatory, much can and must be done to assure their success. Most programs are predicated on the assumption that minority students' entry patterns to higher education are the same as entry patterns for majority students. This is not the case at all. The great majority of minority students enter junior and community colleges. About 60 percent of all minority freshmen begin their baccalaureate careers in these schools (American Council on Education, 1988). They simply don't have the money to go elsewhere and four-year colleges don't have the scholarship money to help them do so. It is also true that more and more talented **majority** students are spending the first two years of their college careers in junior and community colleges because of costs. Their attendance rates, however, are far below those of minority students.

The programs are also predicated on the assumption that minority students entering four-year colleges will have the same mentoring and encouragement to pursue doctorates in science and engineering as majority students. This also is not the case. Indeed, great variations in production of eventual doctorate recipients, generally, can be found among America's four-year colleges and universities. Alexander Astin labels some of the schools "overproducers" and some "underproducers" in this respect. He notes that this is particularly true where science and engineering is considered (Astin, 1993).

Problem Statement

**In summary, institutions which send considerable numbers of students on to**

**doctoral study are special in a number of ways. And institutions which send considerable numbers of minority students on to doctoral study in science and engineering are very special institutions indeed.**

What these institutions do that make them special is unknown. No one has bothered to study them closely and to contrast their work with students with that of others. There has been no compelling reason for them to do so.

There is now a compelling reason for such a study: the need to increase participation of minorities in science and engineering doctoral study. It is well to note here that while many colleges and universities would **like** to send more of their minority graduates on to doctoral study, they simply lack the insights and know-how to go about doing this. They need - **and would welcome** - the benefits deriving from enlightened analyses of the successes of others in this respect. This, in a nutshell, was the purpose of our study.

Nature of the Study

We began our study by developing a compendium of major initiatives to increase minority participation in science and engineering education. Next, we identified and studied the most prolific producers of minority baccalaureates who go on to complete doctorates in science and engineering. We further identified unique techniques employed by a sample of these institutions to recruit promising minority freshmen and mentor them into doctoral study. We did this by on-campus site visits and interviews with officials. We then analyzed the major themes found in these reports. Finally, we developed an **Initiatives Checklist** for institutions wishing to begin, or improve, minority initiatives.

## RESEARCH QUESTIONS

Again, the central purpose of this study was to identify major initiatives to increase minority participation in science and engineering and to study programs in colleges and universities which

are special in their capacity to recruit, groom and mentor minority students into doctoral study in science and engineering. Accordingly, we addressed the following research questions:

1. What major initiatives have been developed to increase minority participation in science and engineering education?

2. What colleges and university programs in America have been the leading producers of minority baccalaureate recipients who went on to complete doctorates in science and engineering in the last five years?

3. What observable characteristics of the **institutions** described above might be considered distinctive?

4. What initiatives and program distinctives do officials at the institutions consider unique and of great value in their efforts to mentor minority students into science and engineering doctoral study?

5. To what degree do the initiatives and program distinctives deemed most successful in the enterprise under study seem exportable to other colleges and universities?

## RELATED RESEARCH

While a few researchers (Brazziel and Brazziel, 1992, Hill, 1991, White, 1992) have compiled and analyzed data on minority science and engineering doctorate recipients, none has looked closely at the role and nature of the "sending schools," i.e., the colleges and universities which prepare these individuals for doctoral study and mentor them into the enterprise, the high producers of minority S&E doctoral starts. The nearest to such is the recent study by a team of researchers commissioned by the American Council on Education to identify distinguishing characteristics of doctorate granting institutions which have outstanding records of receiving minority doctoral aspirants and shepherding them through to degrees (American Council on Education, 1992). This was an excellent study and we used it as the model for our study. It must be pointed out, however, that the study concentrated on the **receiving** schools (the doctorate granting institutions) while our study concentrated on the **sending** schools(the undergraduate institutions). Said differently, our study looked at one end of the pipeline while theirs looked at the other. Further, the ACE study looked at all doctorate degree recipients while the present study concentrated on recipients of science and engineering doctorates.

The work of George Kuh and his team in identifying distinguishing characteristics of colleges which affect the value systems of undergraduates in unusual ways comprised another study for informing the present work. This work resulted in a book appropriately entitled Involving Colleges (Kuh and Associates, 1991). Finally, one of the investigators for our study developed a model for identifying and analyzing baccalaureate colleges of origin of black doctorate recipients (Brazziel 1988).

Generally, combinations of surveys and case studies are becoming the preferred mode for studying key operations within the academy. Statistics from surveys can offer broad interpretations of what is going on campuses, but one also has to use face-to-face interviews to understand the full picture and all of the attendant nuances, it seems. The investigators of the study used this mode in a widely-used study of the uses of labor market data in college and university planning. Ninety institutions were identified and surveyed in this study and ten were subjected to case study analysis This study was sponsored by the National Institute of Education (Brazziel, 1978). A study recently released by the Center for the Study of Higher Education at UCLA is yet another case in point and parallels our study in that it focuses on why undergraduates transfer out of science and engineering programs in the undergraduate years (Astin,1993). This study was supported by NSF. It is well to point out that this study does not concentrate on success stories involving minority groups. It focuses on the failures of large research institutions to adequately serve all students. Again, our study focused on the success stories of institutions working with minority groups.

## METHODOLOGY

With two key exceptions, our study was a replication of the American Council on Educations' widely used study entitled Environments of Support (American Council on Education, 1993) The ACE study identified the most successful programs in the country in the graduation of minority **doctorates**, regardless of field of study. Our study identified and studied the most successful

programs in the country in the graduation of minority science and engineering **baccalaureates** from underrepresented groups who later went on to earn doctorates. We refer to these schools as baccalaureate colleges of origin. Too, as noted above, the ACE study concentrated on the **graduating schools** while our study concentrated on the **sending schools**, the lower end of the pipeline, so to speak.

The ACE team identified and surveyed 235 departments or programs in their study. They analyzed the survey data and selected the six most successful schools for on-campus case studies. Or study did the same, although the figures differed to a great extent. We rank-ordered upward of 1220 schools listed as baccalaureate colleges of origin for black, Hispanic and Indian S&E doctorate recipients. The orderings were made according to the group under analysis. We then made site visits and conducted interviews with officials on eleven campuses.

The ACE team worked with the National Doctorate Survey staff to identify their sample. We did the same. We oversampled non-minority schools for the interviews in order to have a sufficient number of cases from the general population of institutions. The top producers of black baccalaureates who go on for S&E doctorates, for example, are historically black colleges and universities, HBCUs. Most of the black undergraduate students today, however, are in historically white schools, HWCUs.

The ACE team used very simple statistics to analyze its survey data, e.g., rank ordered means and percents. We did the same.

The ACE team used the case study approach common to many excellent descriptive studies, e.g., Kuh's Involving Colleges (1991). We did the same, adding elements of Glazer and Strauss' grounded theory practices to assure integrity (Glazer and Strauss, 1987).

The ACE team developed their findings into a highly publishable document. We have done the same. This is especially true of the highlights section of the study and the Institutional Checklist for Excellence in Initiatives. The ACE forwarded the resulting document to all graduate deans in the

country. Hopefully, the National Science Foundation can find a way to get our report or the highlights of such to key people in colleges and universities around the country. We have already begun to share our findings on an informal and unofficial basis.

This report has four parts: the introduction (this section), a section entitled **Part I, A Compendium of Initiatives to Increase Minority Participation in Science and Engineering Programs**; a section entitled **Part II, Site Visits at High Producers of Minority S&E Doctoral Starts**; a section entitled **Part III, Summary Observations**; and a Part IV section entitled **Initiatives Checklist**. Two Appendices round out the report. Appendix A includes baccalaureate colleges of origin of Indian, Hispanic and black American science and engineering doctorate recipients for the period of 1988-1993. Appendix B includes selected brochures and program descriptions from the initiatives analyzed in the report.

# *Part I*

## *A Compendium of Initiatives to Increase Minority Participation in Science and Engineering Education*

# *PART I*

## *A COMPENDIUM*

### *Initiatives to Increase and Enhance Minority Participation in Science and Engineering Education*

As noted above a first objective of this study was to complete a comprehensive national search to identify initiatives mounted in recent years to enhance minority participation in science and engineering education. Of particular interest were efforts to prepare young minority people for graduate education in these fields.

We began this work by contacting directors of well-known programs and requesting materials which explicated in detail what they were trying to do along with evidence of their goal achievements. We then asked for nominations of other programs which should be included in a compendium such as this. We repeated the process with the nominees and continued until we seemed to have exhausted all existing sources and received material on all existing programs. We then turned to electronic retrieval systems, e.g., Internet, Lexis/Nexis, InfoTrack, Dissertation Abstracts and CD-ROM to identify new projects just coming on-line.

The compendium is organized according to level, beginning with general programs designed to build interest and skills in science and engineering education among minority children and youth and progressing to programs designed to recruit, retain and graduate minority graduate students in these fields. In some cases, large comprehensive programs mount initiatives at all levels and are included in all categories. An example of this would be the Young Scholars programs which are funded by NSF divisions but based on college and university campuses and AMPs (Alliances for Minority Participation), another NSF program which involve all major community and educational groups and which are led by a university.

Notable about the compendium is the focus on talent conservation and interest building. In this respect the large consortia in operation across the country have unusual promise. These include NSF's AMPs (Alliances for Minority Participation) which are large groups of groups, so to speak, e.g., schools, churches, universities, corporations et al, all working together to involve more minorities in science and engineering by doing whatever it takes. Though quite new, AMPs have compiled a record of success in enrolling additional minority college students in science and engineering (percent increase = 23.2) and in graduating larger numbers of minority baccalaureate recipients in these fields (percent increase = 20.2). Further, these increases occurred with less than half the AMPs (N = 12) in operation. Momentum should build here as AMPs reach the full complement of 30. The following data explicate the extent of these successes.

| Year | Minority S&E Enrollment | S&E Baccalaureate Recipients |
|---|---|---|
| 1990 | 63,136 | 6,963 |
| 1993 | 77,797 | 8,396 |

Percent Increases: Enrollment = 23.2; Baccalaureate Recipients = 20.2.

Note: Increases in enrollment and baccalaureate production include data for 12 AMPs service regions: Alabama, Arizona, California, Mississippi, Puerto Rico, Texas, Florida, New York, North Carolina, South Carolina, Illinois, New Mexico.

Notable too is the number of campus-based programs which address the need to increase minority participation in science and engineering. These universities recruit minority students assiduously and work to make them feel at home on campus and complete their degrees. In this respect, the recent actions of the LSU chemistry department is highly notable. The department brought in 20 black doctoral starts in one fell swoop. These students are at LSU as a normal part of the recruitment efforts of the department. No outside funding was used in this effort. Perhaps this is where we want to be in the years ahead where minority involvement is concerned. Just another day at the office.

Researchers will surely note the emphasis of most projects on getting the job done and the relative absence of research projects on succeeding with minority students. Or doing a better job of succeeding. One major piece of useful research is listed: Dr. Uri Treisman's work on minority achievement in the DANA Center at the University of Texas. Dr. Treisman found that black engineering students who emulated Asians in study habits and use of support groups made higher grades in calculus courses. These findings have been useful in action programs across the country and more of this sort of thing could surely benefit ongoing efforts. Many efforts are succeeding without any knowledge on the part of faculty and students about why they are succeeding. There may be no need to know why. Such knowledge, however, could be put to good use in efforts that are less than successful and which need to regroup. Or by faculty and administrators planning initiatives in this area.

## *Science and Engineering Initiatives Targeting Children and Youth*

**Initiative: Alliances for Minority Participation (AMPs)**
Sponsor: The National Science Foundation
Contact Person: Dr. William McHenry, National Science Foundation, 4801 Wilson Blvd., Arlington, VA 22230. 703-306-1283
Scope and Function: When fully funded, the AMP operation will comprise thirty large groups of citizens across the country. Every major minority population concentration will have an AMP. The AMPs will involve schools, colleges, corporations, civic groups and churches working, all working in myriad ways to involve minority children and youth in science and engineering education and to encourage further study in these fields. AMPS can be statewide as in the case of Mississippi or local as in the case of the Newark, NJ AMP. A major university is usually the lead AMP institution. Jackson State University leads the Mississippi AMP and Rutgers University leads the Newark AMP. The National Science Foundation provides funding for each AMP at the rate of $1 million a year. Funding is continued only if stringent annual evaluations show solid progress toward stated goals.
Success Indicators: With only 15 of the AMPs in operation in 1994, the National Center for Education Statistics reported an increase in participation rates of minority children and youths in science and technical education. Enrollment in the service area of the Mississippi AMP doubled, for example, and graduation rates jumped 70 percent. More is expected as all of the AMPs come on line. As of June 15, 1995, 20 AMPs were in operation. They are listed below along with the names and addresses of the directors.

Alabama AMP
Dr. Lois Dale
Office of the Vice President for Academic Affairs
University of Alabama at Birmingham
Birmingham, AL 35294-1170

California AMP
Dr. Laurel Williams
600 Administration Bldg.
University of California-Irvine
Irvine, CA 92717-1023

California State AMP
Dr. Alphonso Ratcliffe
School of Science
San Francisco State University
San Francisco, CA 94132

Chicago AMP
Dr. Dolores Cross
President's Office
Chicago State University
Chicago, IL 60626-1598

Florida/Georgia AMP
Dr. Lynette Padmore
Department of Biology
Florida A&M University
Tallahassee, FL 32307

Metropolitan Detroit AMP
Dr. Hanley Abrahamson
Wayne State University
Detroit, MI 48302

Mississippi AMP
Dr, Richard Sullivan
Jackson State University
Jackson, MS 39217-0619

All Nations AMP
Dr. Joseph McDonald
Salish Kootenai College
Pablo, MT 59855

Greater Newark AMP
Dr. Harold Deutschmann
New Jersey Institute of Technology
Newark, NJ 17102

New Mexico AMP
Dr. Ricardo Jacquez
New Mexico State University
Las Cruces, NM 88003

New York City AMP
Dr. Fitzgerald Bramwell
Dean of Graduate Studies
Brooklyn College
Brooklyn, NY 11210

North Carolina AMP
Dr. Harold Martin
School of Engineering
North Carolina A&T University
Greensboro, NC 27411

Oklahoma State AMP
Dr. Earl Mitchell
Oklahoma State University
Stillwater, OK 74178

Greater Philadelphia Region AMP
Dr. James England
Temple University - Provost Office
Philadelphia, PA 19122

Puerto Rico AMP
Dr. Manuel Gomez
University of Puerto Rico
San Juan, PR 00931

South Carolina AMP
Dr. Michael Howell
University of South Carolina
Columbia, SC 29204

Southern Rocky Mountains AMP
Dr. Gary Keller
Arizona State University
Tempe, AZ 85287

Texas AMP
Dr. Ana Guzman
Texas A&M University
College Station, TX 77843

University of Texas System AMP
Dr. Diane Natalicio
University of Texas at El Paso
El Paso, TX 79968

Washington-Baltimore-Hampton Roads AMP
Dr. Clarence Lee
Howard University
Washington, DC 20059

**Initiative: YSP (Young Scholars Program)**
Sponsor: The National Science Foundation.
Beneficiaries: Minority junior and senior high school students.
Contact Person: Dr. Julia Clark, National Science Foundation, 4801 Wilson Blvd., Alexandria, VA 22230. 703-306-1616.
Scope and Function: School-college partnerships designed to involve more minority youths in science and engineering education. Focuses on junior high and high schools students. Focus is on enriched experiences in the schools and annual campus-based study in summers. Extensive computer networks allow students to communicate with each other and with mentors, college and university mainframe to solve problems, "surf" the Internet et al.
Success Indicators: More students taking more science and mathematics courses. More entering college to study science and engineering, according to NSF data collected on the subject.
Exemplar: Ohio State University with Young Scholars chapters in nine cities in Ohio. Involves 1500 young people, all of whom come to the OSU campus for summer classes and science activities each summer. Note the YSP is not a minority program per se; however, many universities target minority youngsters in their operations.

**Initiative: Urban Mathematics and Science Systemic Initiative**
Sponsor: The National Science Foundation.
Beneficiaries: Urban school children and youth.
Contact Person: Dr. Madeleine Long, National Science Foundation, 4801 Wilson Blvd., Alexandria, VA 22230.
Scope and Function: Grants to major urban school systems to effect systemic changes in mathematics and science and engineering instruction for city schools, most of whose students are members of minority groups. Targets: all children and youth in urban schools.
Success Indicators: More minority children and youth taking more mathematics and science courses.

**Initiative: CPEP (Connecticut Pre-Engineering Program)**
Sponsor(s): Connecticut Chamber of Commerce and various corporations, foundations and private benefactors.
Beneficiaries: Connecticut youth, junior and senior high school.
Contact Person: Glenn Cassis, Director, 950 Trout Brook Drive, West Hartford, CT 06119.
Scope and Function: Offers complementary experiences to develop engineering talent among inner city youth. Includes extracurricular classes during school year, and five-week summer schools. Also includes science fairs, career planning trips and assistance in lining up financial aid for college.

**Initiative: CRCM (Comprehensive Regional Centers for Minorities)**
Sponsor(s) The National Science Foundation and consortia of colleges and universities. Beneficiaries: Precollege minorities at all levels(see examples below, specifically, Morgan State University initiatives).
Contact Person: Dr. Eddie Jones, National Science Foundation, 4801 Wilson Blvd., Arlington, VA 22230
Scope and Function: Science camps, enrichment courses, tutoring, mentoring.

**PMSA (Partnerships for Minority School Achievement)**
Sponsor(s) National Science Foundation and school systems.
Contact Person: Dr. William McHenry, National Science Foundation, 4801 Wilson Blvd. Arlington, VA 22230
Beneficiaries: Precollege minorities at all levels.
Scope and Function: Science camps, field trips, enrichment courses, guidance and motivational activities of a broad nature, all designed to build interest in S&E.

**RCMS (Research Careers for Minority Scholars)**
Sponsor: National Science Foundation
Contact Person: Dr. William McHenry, National Science Foundation, 4801 Wilson Blvd., Alexandria, VA 22230.
Beneficiaries: Minority pre-college youth and minority undergraduates.
Scope and Function: College grants to support a variety of enrichment activities designed to attract and support young people in science and have them make the investment in time and effort to move on to the doctorate.

**Initiative: SEMREP (Science, Engineering and Mathematics Precollege Preparation)**
Beneficiaries: Baltimore area children and youth.
Sponsor: Morgan State University as part of the Comprehensive Regional Center for Minorities (CRCM), a consortium of schools and colleges operating under a five-year grant from the National Science Foundation.
Contact Person: Dr. Edmonia Yates, Director, Comprehensive Regional Center for Minorities, School of Engineering, Morgan State University, Baltimore, MD 21239.
Scope and Function: An end product of NSF's CRCM program described above. Offers science seminars summer math/science experiences, SAT preparation classes, bridge programs for high school science and math, science and math learning centers, science camps, informal education, and teacher staff development.

**MRCE (Minority Research Centers of Excellence)**
Beneficiaries: Minority students headed to S&E graduate study and research careers.
Contact person: Dr. Tony Mitchell, National Science Foundation, 4801 Wilson Blvd., Arlington, VA 22230.
Scope and Function: Grants to MSIs (Minority Serving Institutions) to strengthen infrastructure and enhance research capabilities.

**ACE (Academic Champions of Excellence)**
Beneficiaries: Baltimore area children and youth.
Sponsor: Morgan State University in collaboration with other colleges and universities and Baltimore and Prince Georges County schools. Receives support from the Maryland Higher Education Commission and the Carnegie Foundation of New York.
Contact Person: Dr. Alice Morgan-Brown, Director, Academic Champions of Excellence, School of Education and Urban Studies, Morgan State University, Baltimore, MD 21239.
Scope and Function: Work to increase the number of students who complete Algebra I in the eighth or ninth grade, enroll in geometry by grade 10 and enroll in courses leading to solid preparation for college. Math/science majors are especially encouraged. Comprehensive set of activities and experiences: Saturday enrichment classes, Summer Scholars Programs, role model speakers, field trips, math/science competitions, volunteer services and recognition awards. In-service activities for teachers and parents.

**Initiative: High School Pre-Engineering Program**
Beneficiaries: Baltimore and area minority high school students.
Sponsor: Morgan State University School of Engineering in collaboration with Southwestern High School of Baltimore. Funded under the Outreach Program of Project ECSEL.
Contact Person: Dr. Carl White, Director, High School Pre-Engineering Program, School of Engineering, Morgan State University, Baltimore, MD 21239.
Scope and Function: Operates an alternative computer assisted math and science curriculum coupled with multi-media modules.

**Initiative: MUCH (Morgan Undergraduate Chemist Help)**
Sponsor: Morgan State University in collaboration with the Baltimore Public Schools.
Beneficiaries: Baltimore area minority children and youth.
Contact Person: Dr. Roosevelt Shaw, Chair, Department of Chemistry, Morgan State University, Baltimore, MD 21239.
Scope and Function: Variety of activities designed to promote excitement for science among children and youth. Starts with fourth-graders and affords observation and participation in laboratory science projects and experiments, science video-viewing, completion of experiments from Science Weekly and Wonder Science, study of careers of outstanding black scientists and work with Morgan State mentors on preparing for science careers.

**Initiative: Pre-College S&E Exploration**
Sponsor: Morgan State University
Beneficiaries: Baltimore area minority high school students
Contact Person: Dr. Eric A. Cheek, Director Pre-College Career Exploration in Engineering and Science, School of Engineering, Morgan State University, Baltimore, MD 21239.
Scope and Function: Special summer and after-school classes in physics, computer science, robotics and electronic equipment; field trips to NASA installations et al; engineering competitions and workshops on career planning and communications skills.

**Initiative: PRIME (Programs to Inspire Minorities into Education)**
Sponsor: Morgan State University
Beneficiaries: Baltimore area minority children and youth.
Contact Person: Ms. Brenda P. Haynes, Director, PRIME, Morgan State University, Baltimore, MD 21239.
Scope and Function: Coalition of colleges with Morgan as lead institution. Includes the Maryland MESA Program (Mathematics, Engineering and Science Achievement). Aim: more minority teachers. Includes welter of outreach and pre-college enrichment experiences.

**Initiative: Project RAISE (Raising Ambition Instills Self Esteem)**
Sponsor: The Baltimore Mentoring Institute.
Beneficiaries: Baltimore area minority children and youth.
Contact Person: Dr. Richard Rowe, Director, RAISE, Baltimore Mentoring Institute, 605 North Eutaw Street, Baltimore, MD 21201.
Scope and Function: Works with sixth graders to decrease drop-out rates and improve life-chances of sixty children by providing in-school advocates and one-on-one site mentors.

**Initiative: Native American Mathematics and Science Education Leadership**
Beneficiaries: Sioux children and youth. Program is funded by NSF.
Contact Person: Leland Bordeaux, Sinte Gleska College Center, Rosebud, SD 57570
Scope and Function: Initiative to increase participation of Sioux people in science and engineering study.

**Initiative: Mathematics for Indians Summer Horizon Institute**
Beneficiaries: Indian students aspiring to S&E baccalaureate completion. Program is funded by NSF.
Contact Person: Sunil Kemawat, Turtle Mountain Community College, Bel Court, ND 58316.
Scope and Function: A NSF Young Scholars Program to enhance excellence in science and engineering among Indians on the High Plains.

**Initiative: California MESA (Mathematics, Engineering and Science Achievement).**

Beneficiaries: California elementary and high school students
Contact Person: Fred Easter, 300 Larsiog Drive, Oakland, CA 94618.
Scope and Function: Mentoring, tutoring of promising students to conserve S&E talent and send students on to college. Creation of peer groups to reinforce the notion of being a good student as "OK."

**Initiative: Maryland MESA (Mathematics, Engineering and Science Achievement).**
Beneficiaries: Maryland minority elementary and high school students
Contact Person: Dr. Robert Willis, Johns Hopkins University Physics Labs, Laurel, MD 02115
Scope and Function: Mentoring and tutoring of promising students to conserve S&E talent and send students on to college study in S&E fields.

***Initiative: MESA(s) (Mathematics, Engineering and Science Achievement) National Listing***
Beneficiaries: Minority children and youth
Contact Person(s): See below.
Note: MESA operations are perhaps the most popular and widely used methods of reaching children and youth and drawing them to science and engineering. These programs supplement regular science and mathematics instruction by sponsoring after-school instruction, Saturday Academies, science fairs and competitions. Attendance at fairs and competitions for CPEP, a Connecticut MESA, for example, was revealing: 500+ minority junior high school students organized as teams to compete in solar boat racing, mag-lev auto racing, egg-drop et al. All of the cars, boats and packaging designs for the eggs were created by the teams.

MESA programs receive support from a wide variety of sources. The New Mexico MESA is funded by the New Mexico Department of Education while Connecticut's CPEP is supported by corporations. The National Science Foundation's Urban Systemic Initiative is now contributing support to some MESAs. The MESA idea was begun in the late 70s in California. A comprehensive listing of MESAs as of June 1, 1995, along with their directors, is found below.

ACE (Champions for Excellence)
Dr. Alice Morgan-Brown
Morgan State University
Baltimore, MD 21239

BEAM (Buffalo Area Engineering for Minorities)
Dr. Dorothy Gogel
SUNY Buffalo
Amherst, NY 14260

CA-MESA (California MESA)
Fred Easter
300 Larsiog Drive
Oakland, CA 94618-3550

CAUSA (Comprehensive Activities to Upgrade Science Academics)
Dr. Pablo Rivera Ortiz
Ana Mendez Foundation
Rio Piedras, PR 00928

CHROME (Cooperating Hampton Roads Organizations for Minorities in Engineering)
Dr. Judith Shay
P.O. Box 1304
Norfolk, VA 23501

CMEA (Colorado Minority Engineering Association)
Dr. Gilbert Lopez
Columbia University
New York, NY 10003

C-PEP: (Connecticut Pre-Engineering Program)
Dr. Glenn Cassis
Science Museum of Connecticut
Trout Brook Drive
West Hartford, CT 06119

DAPCEP (Detroit Area Precollege Engineering Program)
Dr. Kenneth Hill
80 Fransworth Street
Detroit, MI 48202

FAME (Forum to Advance Minorities in Engineering)
Guzelous Molock
100 West 10th Street
Wilmington, DE 19801

GEST (Gateway to Engineering Science and Technology)
Dr. Rose Daltsman
University of Wisconsin
P.O. Box 784
Milwaukee, WI 53201

MACESA (Mid-America Consortium for Engineering and Science Achievement)
Dr. Kenneth Gowdy
Kansas State University
Manhattan, KS 66506

MassPEP (Massachusetts Pre-Engineering Program
Dr. John Newhouse
553 Huntington Avenue
Boston, MA 02115

MD-MESA (Maryland MESA)
Dr. Robert Willis
Johns Hopkins University Physics Laboratories
Laurel, MD 02115

METCON (Metropolitan Consortium for Minorities in Engineering)
Dr. Elbert Cox
Howard University
Washington, DC 20059

MBEN (Mathematics and Science Education Network)
Dr. Carol MaBon
University of North Carolina
Chapel Hill, NC 27599-3345

NJIT-Pre (New Jersey Institute of Technology Center for Pre-College Programs)
Dr. Howard Kimmel
New Jersey Institute of Technology
Newark, NJ 07012

NM MESA (New Mexico Mathematics, Engineering and Science Achievement)
Dr. Evangeline Sandoval
2808 Central S.E.
Albuquerque 87106

PRIME (Philadelphia Regional Introduction for Minorities to Engineering)
Dr. Alexander Tobin
138 South 19th Street
Philadelphia, PA 19103-4907

Leap (Louisiana Engineering Advancement Program for Minorities)
Dr. George Baker
Xavier University
New Orleans, LA 70125

PRISM (Program to Interest Minorities in Engineering)
Dr. Kim Robbins
930 East Avenue
Rochester, NY 14607-2241

SECME (Southeastern Consortium for Minorities in Engineering)
Dr. R. Guy Vickers
Georgia Institute of Technology
Atlanta, GA 30332

WA-MESA (Mathematics, Engineering and Science Achievement)
Dr. Patricia MacGowan
University of Washington
Seattle, WA 98195

Utah-MESA (Mathematics, Engineering and Science Achievement)
Dr. Fanaye Turner
Utah State Office of Education
Salt Lake City, UT

TAME (Texas Alliance for Minorities in Engineering)
Dr. Jackie Jordan-Davis
University of Texas
Austin, TX 78712-1080

UCMEP (Union County Minority Engineering Program)
Dr. Elmer Wood
Union County College
Cranford, NJ 07016

**Initiative: Emerging Scholars Programs.**
Beneficiaries: Children, youth and undergraduates all over the country.
Contact Person(s) Contact Ms. Venna Kaul, Dana Center , University of Texas.
Scope and Function: Programs are spinoffs of Dr. Uri Treisman's work with minority calculus students at California-Berkeley.

## *Science and Engineering Initiatives Targeting College and University Students*

## Major Fellowship Sources for Graduate Study

Initiative: National Science Foundation Minority Doctoral Fellowships
Beneficiaries: Minority S&E doctoral students.
Contact Person: Susan W. Duby, National Science Foundation, 4801 Wilson Blvd., Alexandria, VA 22230. Note: the day-to-day operations of applications, screening et al is handled by the Oakridge Associated Universities. Contact person: Director, Oak Ridge Associated Universities, Attn: NSF Graduate Research Fellowship Program, P.O. Box 3010, Oak Ridge, TN 37831-3010.
Scope and Function: NSF fellowships for up to five years for students pursuing S&E doctorates. Fellowships provide $14,400 annually plus an institutional allowance of $8600.

**Initiative: The Meyerhoff Fellows Program**
Beneficiaries: Black male freshmen with 650 SAT-M scores interested in S&E doctorates.
Sponsor: University of Maryland Baltimore County with grants from Robert Meyerhoff, a Baltimore philanthropist.
Contact Person: Dr. Freeman Hrabowski, President, University of Maryland, Baltimore County, Catonsville, MD 21228.
Scope and Function: Increases the number of black A&E doctorates by national recruitment effort and full scholarships for very talented black students (650+ SAT-M).

**Initiative: The Dozertz Fellows Program**
Beneficiaries: Black male freshmen with 650+ SAT-M interested in S&E doctorates.
Contact Person: Dr. Lawrence Mattix, Professor of Physics, Norfolk State University, Norfolk, VA, 23504.
Scope and Function: Financial support, mentoring et al to increase the number of black S&E doctorates. Rceives significant support from Robert Dosertz, a Norfolk philanthropist.

**Initiative: The Florida Endowment Program**
Beneficiaries: Minority S&E doctoral students.
Sponsor: The Florida Endowment Fund (The McKnight Fellowship Program)
Contact Person: Dr. Israel Tribble, President, The Florida Endowment Fund, 201 East Kennedy Blvd. #1525, Tampa, Fl 33602

Scope and Function: Operating agency for the McNight Fellowship Program. Awards fellowships to minority S&E doctoral students. Leads nation in both awards and S&E graduates who have received support. Has begun Centers of Excellence programs to work with children and youth to build interest and skills in S&E. These centers involve black churches, operate McKnight Achievement Societies, sponsor county and regional "Brain Bowls" and sponsor Academic Enrichment Centers to supplement and enhance regular school activities.

**Initiative: GEM (National Consortium for Graduate Degrees for Minorities in Engineering and Science)**
Beneficiaries: Minority S&E Ph.D. students. Consortium is funded by corporations and private benefactions.
Contact Person: Dr. Howard Adams, Director, P.O. Box 537, Notre Dame, IN 46556.
Scope and Function: Initiative to increase minority participation in S&E Ph.D. study. GEM awards some 300 fellowships a year.

**Initiative: Compact for Faculty Diversity**
Beneficiaries: Minority S&E doctoral starts with aspirations for college teaching. A consortium comprising The New England Board of Higher Education, Southern Region Education Board, and Western Interstate Commission on Higher Education.
Contact Person: Dr. Emorcia Hill, New England Board of Higher Education, 45 Temple Place, Boston, MA 02111.
Scope and Function: Works to increase the number of minority S&E doctorates - and potential faculty members. Awards fellowships to doctoral starts. Encourages member institutions in regions to increase undergraduates in pipeline. Awards upwards of 300 full scholarships each year on a competitive basis.

**Initiative: (NCEAGS) National Center for Equal Access to Graduate Study**
Beneficiaries: Aspiring minority S&E doctoral starts.
Contact Person: Dr. Leroy Ervin, 161 Spring Street #800, Atlanta, GA 30303.
Scope and Function: Effects matches between aspiring minority S&E doctoral starts and interested graduate schools. Supplements assistantships and fellowships where necessary. Receives support from corporate benefactors and government agencies, particularly the Department of Defense which is interested in placement of officers affected by downsizing efforts of the military.

**Initiative: USRP (Undergraduate Student Researchers Program) Underrepresented Minority Focus (UMF)**
Beneficiaries: Minority science and aerospace students. Sponsor: National Aeronautics and Space Administration.
Contact Person: Deborah Russell, NASA Headquarters, 400 Maryland Avenue, Washington, DC 20546.
Scope and Functions: Awards grants to S&E minority students pursuing degrees in areas of study compatible to NASAs program in science and aerospace technology.

**Initiative: Minority Participation in Graduate Education**
Beneficiaries: Minority undergraduates contemplating graduate study in S&E.
Contact Person: Dr. William Miller, Office of Higher Education Programs, U.S. Department of Education, Washington, DC 20202.
Scope and Function: Funds 70-80 colleges each year to mount initiatives to encourage minorities to attend graduate school. Summer classes, GRE assistance. Assistance in lining up fellowships and assistantships. Gives preference to colleges stressing S&E.

**Initiative: Ford Foundation Fellowships**
Beneficiaries: Minority doctoral students.
Contact Person: Dr. Edgar Beckham, Director of Education and Cultural Programs, The Ford Foundation, 320 East 43rd Street, New York, NY 10021
Scope and Function: Underwrites graduate fellowships for minority doctoral students. Grants are administered by the Educational Testing Service.

**Initiative: General Electric Foundation Fellowships**
Beneficiaries: Minority graduate students, mainly doctoral, S&E given preference
Contact Person: Dr. Reginald Smith, President, The General Electric Foundation, 3138 Eastern Avenue, Fairfield, CT 06431.
Scope and Function: Underwrites graduate fellowships for minority students with emphasis on S&E doctoral aspirants. Contributes to the Connecticut Pre-Engineering Project, a program for building interest in engineering among city youth. See above in Part I.

**Initiative: MARC Predoctoral Fellowships** (Minority Access to Research Careers)
Beneficiaries: Minority doctoral students in S&E.
Contact Person: Dr. Walter Schaffer, Research Training Officer, National Institutes of Health, Bethesda, MD 20892
Scope and Function: Awards for up to five years for students pursuing the Ph.D. in the biomedical or behavioral sciences. Fellowships provide $10,008 annually plus an institutional allowance of $2000.

**Initiative: HUGHES BRT (Howard Hughes Biomedical Research Training)**
Beneficiaries: Baltimore area undergraduates.
Sponsor: Morgan State University with support from the Howard Hughes Medical Institute.
Contact Person: Dr. Cecil W. Payton. Director, Howard Hughes Biomedical Research Training Program, Morgan State University, Baltimore, MD 21239.
Scope and Function: Offers opportunities for undergraduate research in biomedical areas, both at Morgan and at other universities and installations.

**Initiative: ENCOM (Environmental Management Career Opportunities)**
Beneficiaries: Minority students headed toward S&E graduate study.
Contact Person: Director, ENCOM, U.S. Department of Energy, Washington, DC 20202
Scope and Function: Provides opportunities for undergraduate research for minority students headed to S&E physical sciences doctorates.

**Initiative: MAGNET (Minority Access Graduate Networking)**
Beneficiaries: Minority graduate students in New York City and elsewhere.
Contact Person: Dr. Gail Smith, Associate Dean, The Graduate School and University Center, City University of New York, 33 West 42nd Street, New York, NY 10036-8099.
Scope and Function: Comprehensive program aimed at increasing graduate degree recipients among New York's minorities. Includes financial aid, mentoring, a magnet community for support and weekly roundtables for reports of progress, research, problems, and just talk. Fellowship aid is laddered, e.g., Presidential Fellowships for doctoral starts in the first year, Humana Fellowships for ABDs, Dissertation Year Fellowships for people doing research and writing. Also includes a Chancellor's Postdoctoral Fellowship.

**Initiative: University of Washington Minority Science and Engineering Program**
Beneficiaries: Minority S&E students at all levels.

Contact Person: Dr. Gene Magallenes, Director 207 Loew Hall FH-10 University of Washington, Seattle, WA 98195.
Scope and Function: Comprehensive program aimed at remediating shortfalls in S&E manpower due to demographic shifts by increasing minority participation at all levels. Works closely with the North Carolina Alliance for Minority Progress (NCAMP), nationwide consortium of colleges and universities which recruits and educates mostly black S&E doctorates. Recruits and awards assistantships and fellowships to minority S&E doctoral starts.

**Initiative: The LSU Chemistry Department**
Beneficiaries: Black chemistry doctoral students.
Contact Person: Dr. Neil Kestner, Head, Chemistry Department, Louisiana State University, Baton Rouge, LA 70803.
Scope and Function: Embarked on a new policy of recruiting black doctoral starts in great numbers. Added 20 such individuals to the doctoral student population in fall 1994. Key Innovation: Discussions of successes of the new policy on the Internet.

**Initiative: Native American Fellowship Program**
Beneficiaries: Indian S&E undergraduate and graduate students.
Contact Person: Applications are made to tribal representatives.
Scope and Function: Need-based scholarships provided by the Department of the Interior for Indian undergraduates enrolled in S&E undergraduate and graduate programs.

**Indian Health Service Scholarships**
Beneficiaries: Indians enrolled in allied health fields.
Contact Person: The Director of the Scholarship Program, Indian Health Service, Twinbrook Plaza, Suite 111, 12300 Twinbrook Plaza, Rockville, MD 20857.
Scope and Function: Preparatory scholarships for summer schools and enrichment plus college scholarships which include tuition plus stipend to increase the number of Indian health service workers.

**Native American Scholarship Fund**
Beneficiaries: Indian paraprofessionals returning to school for baccalaureates in S&E fields.
Contact Person: Dr. Dean Shavers, 8200 Mountain Road N.E., Albuquerque, NM 87110.
Scope and Function: Program designed to effect career ladders for Indian students who must work to complete college.

**Initiative: GM Hispanic Engineering Scholarships**
Beneficiaries: Hispanic engineering students.
Contact Person: Dr. Brent Willis, LULAC National Educational Centers, 777 North Capitol Street, NE, Suite 305, Washington, DC 20002
Scope and Function: Partial scholarships ($2000) to Hispanic engineering majors with at least a 3.25 GPA.

**Initiative: Dental Hygenist Scholarships**
Beneficiaries: Students accepted for dental hygenist schools.
Contact Person: Scholarship Coordinator, American Dental Hygenist Association, Institute for Oral Health, Suite 3400, 444 North Michigan Blvd, Chicago, IL 60611.
Scope and Function: Partial scholarships ($1000-1500) for first and second year dental hygiene students.

**Initiative: Dental School Scholarships**
Beneficiaries: First-year minority dental students.
Contact Person: Director of the Scholarship Program, American Fund for Dental Health, 211 East Chicago Ave, #820, Chicago., IL 60611.

**Initiative: AT&T Scholarships**
Beneficiaries: Minority engineering and computer science students, both graduate and undergraduate.
Contact Person: Rochelle Richardson, A&T Bell Labs, 101 Crawfords Corner Road, Holmdel, NJ 07733-3030.
Scope and Function: All-expense awards for minority engineering and computer science students.

**Initiative: Geosciences Scholarships**
Beneficiaries: Minority undergraduate students
Contact Person: Dr. Marcus Milling, AGI-MPP, American Geological Institute, 4220 King Street, Alexandria, VA 22302.
Scope and Function: All-expense awards for minority undergraduate students studying Geosciences. Partial awards for graduate students.

**Initiative: CIC Predoctoral Fellowships in the Sciences**
Contact Person: Dr. Gloria Gibson-Hudson, Committee on Institutional Cooperation, Kirkwood Hall 111, Indiana University, Bloomington, IN 47405.
Scope and Function: Scholarships for minority S&E doctoral starts at Big Ten institutions.

Note: CIC is one of the oldest doctoral scholarship initiatives for minorities in America. Many of the newer initiatives such as the Compact for Faculty Diversity have used CIC as a model. It is an excellent example of the use of minority-serving feeder schools, notably black colleges and universities in the South. A large proportion of the life science faculty at Southern University of Louisiana, for example, completed their degrees at the University of Iowa and received CIC assistance to aid them in their work. More important, they comprised a tremendous cadre of role models and mentors for undergraduates at Southern. Young doctoral starts who "goup the river" to Iowa City are met and shown the ropes by graduate students from Southern who are well along in their graduate work.

## *Research Centers, Enrichment Programs and Organizations*

**Initiative: AISES (American Indian Science and Engineering Society)**
Beneficiaries: Indian S&E graduate and undergraduate students
Contact Person: Norbert Hill, AISES, 1630 30th Street, Suite 301, Boulder, CO 80301
Scope and Function: Wide variety of activities aimed at increasing the presence of American Indians among the ranks of scientists and engineers. Includes scholarship awards, college chapters, annual conferences, monthly magazine.

**Initiative: The Dana Center**
Beneficiaries: Minority S&E students.
Sponsor: University of Texas with support from the Dana Foundation
Contact Person: Dr. Uri Treisman, Director, The Dana Center, University of Texas, Austin, TX 78712.
Scope and Function: Continuation of the work of Dr. Uri Treisman in promoting high achievement in mathematics among minority students which was begun at the University of California at Berkeley.

**Initiative: CASI (Center for the Analysis of Structure and Interface)**
Beneficiaries: New York City minority S&E majors at City College of New York.
Contact Person: Dr, Leo Rodin, Chair, Chemistry, City College of New York/CUNY, Convent Avenue at 138th Street, New York, NY 10031.
Scope and Function: Affords undergraduates research opportunities by involving them in five ongoing research projects.

**Initiative: CRS (College Research Scholars)**
Beneficiaries: S&E majors at City College of New York.
Contact Person: Dr. Leo Rodin, Chair, Chemistry Department, City University of New York/CUNY, Convent Avenue at 138th Street, New York, NY 10031.
Scope and function: Undergraduate research, mentoring et al to guide minority students into further study and research careers.

**Initiative: FORCE (Focused Opportunities for Careers in Engineering)**
Beneficiaries: City College of New York minority engineering doctoral students
Contact Person: Chair, Department of Engineering, City College of New York/CUNY, Convent Avenue at 138th Street, New York, NY 10031.
Scope and Function: Mentoring et al aimed at assuring completion of engineering doctorates by a larger number of minority students.

**Initiative: The Jaime Escalante Math and Science Center**
Beneficiaries: Beginning college students, mostly Hispanic. Program funded by NSF.
Contact Person: Dr. George Madrid, Department of Mathematics, East Los Angeles College, Monterey Park, CA 91754.
Scope and Function: Work with Hispanic students to develop more high achieving Hispanic calculus students. Continues and broadens the work of Jaime Escalante, the legendary calculus teacher and subject of the movie: **Stand and Deliver.**

**Initiative: Bridges to the Baccalaureate**
Beneficiaries: Community college students aspiring to S&E baccalaureate completion. Program funded by NSF.
Contact Person: Dr. Americo Rivera, Jr., National Institutes of Health, Bethesda, MD 20892
Scope and Function: Promotes the development of transition programs to enhance continuation of S&E community college graduates to baccalaureate study in four-year colleges and universities.

**Initiative: Navaho Community College Science Honors Program**
Beneficiaries: Aspiring Indian baccalaureate students in S&E. Program is funded by NSF.
Contact Person: Dr. George Bauer, Navaho Community College, Shiprock, NM. 87420
Scope and Function: Work with highly capable students to enhance excellence in mathematics, science and technology. Hopefully, send more on to baccalaureates and to doctoral starts.

**Initiative: NPSC (National Physical Science Consortium)**
Beneficiaries: Women and minority S&E doctoral students. Consortium is sponsored by New Mexico State University and sister institutions.
Contact Person: Dr. James Garcia, New Mexico State University, Las Cruces, NM 88003.
Scope and Function: Grants graduate fellowships for study in the physical sciences for women and minorities. Also offers summer internship experiences for these groups.

**QEM (Quality Education for Minorities Network Internship Program)**
Beneficiaries: Minority interns in S&E leadership and policy development. Sponsor, Goddard Space Flight Center et al.
Contact Person: Dr. Shirley McBay, Director, QEM Network, 1818 N Street, NW, Washington, DC 20036.
Scope and Function: Seeks to expose minority students to issues, areas of research and programs related to education of minorities. Aimed at leadership development.

**Initiative: NACME (National Action Council for Minorities in Engineering)**
Beneficiaries: Prospective minority engineering baccalaureates. Sponsor: 200 corporations.
Contact Person: Dr. George Campbell, NACME, No. 3 West 35th. Street, New York, NY 10001. Scope and Function: Scholarships to minority engineering baccalaureate prospects. Grants to schools to work with minority elementary students to head them toward engineering.

**Initiative: NOBCChE (National Organization for the Professional Advancement of Black Chemists and Chemical Engineers).**
Beneficiaries: Black undergraduate and graduate students.
Contact Person: Dr. Victor McCrary, AT&T Bell Labs, Plainfield, NJ 07061.
Scope and Function: Assists universities in recruitment, internship arrangements, mentoring.

**Initiative: The Society of Mexican-American Engineers and Scientists**
Beneficiaries: Mexican American undergraduate and graduate students.
Contact Person: Director, MAES, Box 6650, Torrance, CA 90504.
Scope and Function: Promotes awareness of engineering careers among young Latinos. Sponsors student chapters of Mexican-American scientists and engineers on college campuses. Helps in arranging for summer research opportunities for students. Mentoring.

**Initiative: MARC-HURT (Minority Access to Research Careers-Honors Undergraduate Research Training Program)**
Beneficiaries: Minority undergraduates headed to doctoral study in S&E.
Sponsor: Colleges and universities with funding from the National Institutes of General Medical Science and other institutes of the National Institutes of Health.
Contact Person: Director of Minority Programs, National Institutes of Health, Bethesda, MD. Scope and Function: Intensified courses leading to doctoral study for honors S&E undergraduates. Includes internships in laboratories at other universities, review courses for the GRE and pre-doctoral fellowships for the more distinguished MARC-HURT graduates. Intensive assistance in lining up assistantships and fellowships is accorded all MARC-HURT graduates.

**Initiative: MBRS Program (Minority Biomedical Research Support)**
Beneficiaries: Minority undergraduates headed to doctoral study.
Contact Person: Director of Minority Programs, National Institutes of Health, Bethesda, MD.
Scope and Function: Summer courses and laboratory work to train students to work in research laboratories, present their work to the faculty et al.

**Initiative: RCMS (Research Careers for Minority Scholars)**
Beneficiaries: Minority S&E undergraduate students.
Contact Person: Director RCMS, Directorate for Education and Human Resources, National Science Foundation, 4201 Wilson Blvd. Arlington, VA 22230.
Scope and Function: NSF support for enrichment programs at colleges and universities to retain a

significant number of minority students in the S&E pipeline. Grants of $150,000 to $250,000 awarded for counseling, mentoring, tuition awards.

**RIMI (Research Improvement in Minority Institutions)**
Beneficiaries: Minority institutions.
Contact Person: Director of RIMI Awards, National Science Foundation, Directorate of Human Resources, 4201 Wilson Blvd. Arlington, VA 22230.
Scope and Function: NSF grants of up to $500,000 per year to strengthen faculty research, facilitate acquisition of research equipment and mount cooperative research projects among minority institutions (HCBUs and Indian and Hispanic Serving Institutions/ ISIs and HSIs) and thus enable them to increase their participation in S&E.

**MRCE (Minority Research Centers of Excellence)**
Beneficiaries: Minority institutions seeking to improve research capabilities
Contact Person: Dr. William McHenry, National Science Foundation, 4201 Wilson Blvd, Arlington, VA 22230.
Scope and Functions: Substantial grants to minority-serving institutions to expand curriculum and to enhance research capabilities.

**Initiative: HYPERAMP (Hyper Alliance for Minority Participation)**
Beneficiaries: Minority undergraduates aspiring for graduate work in S&E.
Contact Person: Dr. Antonio Garcia, Professor of Engineering, Arizona State University, Tempe, AZ 85287.
Scope and Function: Innovative software which is loaded down from the Internet by interested students. Includes comprehensive cross-listings of special opportunities for minority S&E students at colleges and universities across the nation. Companion software, HyperAid, helps in lining up assistantships and fellowships. ASU,s Hispanic Research Center developed and is maintaining the software under sponsorship of NSF.

**Initiative: Science and Engineering Alliance**
Beneficiaries: S&E students in HBCUs (Historically Black Colleges and Universities).
Contact Person: Dr. William Dixon, Lawrence Livermore National Laboratories, Livermore, CA. 94550.
Scope and Function: Four HBCUs: Jackson State University, Prairie View University, Southern University and Alabama A&M University works closely with the Livermore Labs to enhance the research infrastructure, enhance research opportunities for students, increase numbers completing the Ph.D. in S&E.

**Initiative: Sandia National Labs' HBCU Summer Programs**
Beneficiaries: Historically Black college and university S&E students.
Contact Person: Dr. Kenneth Holley, Sandia Laboratories, P.O. Box 5800, Albuquerque, NM 87101.
Scope and Function: Summer employment, internships, mentoring for black S&E students.
enrolled in selected HBCUs (Historically Black Colleges and Universities).

**Initiative: PROJECT 1000.**
Beneficiaries: Hispanic undergraduate students aspiring to graduate study.
Contact Person: Michael Sullivan, %The Graduate College, Arizona State University, Tempe, AZ 85287.
Scope and Function: Facilitates applications to graduate schools of Hispanic students. Pays fees for up to eight applications. Works closely with graduate schools across the country to expedite admissions and financial aid.

# *PART II*

# *Site Visits at High Producers*

*of*

## *Minority S&E Doctoral Starts*

***University of Oklahoma***

***Oklahoma State University***

***Northeast Oklahoma State University***

***Howard University***

***Hampton University***

***University of Maryland***

***University of Maryland - Baltimore County***

***Morgan State University***

***Cornell University***

***University of California at Los Angeles***

***Arizona State University***

## *Site Visits at High Producers of Minority S&E Doctoral Starts*

This section of the report contains reports of on-site interviews of officials at colleges and universities identified as colleges of baccalaureate origins of large numbers of minorities who went on to earn science and engineering doctorates.

As noted earlier in the report, the National Research Council was asked to search their databases and rank order the leading colleges of baccalaureate origin for Indian, Hispanic and black American S&E doctorate recipients for the last five years.

About The Site Visitors

For Indians the top ten schools included the University of Oklahoma, Oklahoma State University and Northeastern Oklahoma State University. Dr. Karl J. Beeler, Associate Vice Chancellor for Student Affairs at the University of Missouri at St. Louis visited these campuses and prepared a report on their distinctives, i.e., what initiatives they had mounted to enhance Indian achievement and advanced study in science and engineering that would not be found on the average campus in America.

For Hispanics, the top ten schools included Cornell University, the University of California at Los Angeles and Arizona State University. Dr. NKetchie Agwu, a mathematics instructor at Syracuse University, visited Cornell University. Anita Fields of Anita Fields & Associates of Playa Del Ray, California visited UCLA and Dr. William F. Brazziel of the University of Connecticut, visited Arizona State.

For black Americans the top ten schools included Howard University, Hampton University, Morgan State University, the University of Maryland and University of Maryland -Baltimore County. Dr. William F. Brazziel, Professor of Higher Education and Director of Higher Education Programs at the University of Connecticut visited Howard University. Mamye Bacote, a staff associate in the Virginia House of Delegates, visited Hampton University, University of Maryland - Baltimore County and Morgan State University. Janice Hamilton Outtz of the Center for Demographic of Washington, DC and a

principal in Hamilton Outtz Consulting of Laurel Maryland visited the University of Maryland.

Indian doctorate recipients for the five years of the analysis (1988-1993) claimed 195 institutions as baccalaureate colleges of origins. Hispanic recipients claimed 480 institutions and black recipients claimed 537 institutions. Significantly, Indians, Hispanics and blacks can be found at large numbers of the 1500 or so baccalaureate granting colleges in America, but only a few institutions send them on to complete S&E doctorates. The NRC rank-orders of colleges of baccalaureate origins can be found in the Appendix.

# *Site Visit Reports:*

# *Northeastern State University*

# *Oklahoma State University*

# *The University of Oklahoma*

***Karl J. Beeler***

Three American universities have particularly outstanding records of success in enrolling, encouraging and supporting Native American undergraduates who may then go on to doctoral study in science and engineering fields. Not surprisingly, all three of these institutions (Northeastern State University, Oklahoma State University, and The University of Oklahoma) are located in Oklahoma, a state with a rich American Indian heritage and a relatively large population of Native Americans and associated tribal communities.

It is noteworthy that in the early nineteenth century, long before its statehood, the lands now known as Oklahoma were officially named "Indian Territory" by the United States federal government and a systematic relocation of substantial numbers of American Indians from their traditional homelands to this region was completed. Between 1822-42 Cherokee, Chickasaw, Choctaw, Creek, and Seminole peoples were brought from the Southeast to Indian Territory. The most remarkable of these relocations was the infamous "Trail of Tears" march of the Cherokee Nation from Georgia and North Carolina to the northeast corridor of Indian Territory in the winter of 1838-39; one-fourth of these persons perished en route from disease, starvation, or exposure. Today, Oklahoma is home to members of more than thirty Native American tribes, including

Apache, Arapaho, Caddo, Catawba, Cherokee, Cheyenne, Chickasaw, Choctaw, Comanche, Creek, Iowa, Kansa (Kaw), Kickapoo, Kiowa, Missouri, Modoc, Oto, Ottawa, Osage, Pawnee, Peoria, Ponca, Potowatomi, Quapaw, Sauk and Fox, Seminole, Seneca, Shawnee, Tonkawa, Wichita, and Wyandot.

## *Northeastern State University*

Our first site visit was to Tahlequah, Oklahoma, capitol of the Cherokee Nation since 1839 and the home of Northeastern State University since its founding in 1846. We visited with Dr. W. Neil Morton, Dean of the Graduate College and Director of the Center for Tribal Studies, and two very capable staff members, Carol Young and Carol Rhoads. At Oklahoma State University in Stillwater, we met with Dr. Pete G. Coser, Coordinator of the Multicultural Development & Assessment Center. Finally, we visited The University of Oklahoma in Norman and met with Brett E. Williams, Assistant Director of Student Support Services, and Jon Ringlero, Counselor/Recruiter, Minority Engineering Programs.

Northeastern State University, founded in 1846, is a state-supported comprehensive coeducational institution with a total enrollment of just over 9,000 students, with 7,800 undergraduates, 96 percent of whom are from Oklahoma and 17 percent (about 1,300) of whom are Native American.

In 1970, NSU contracted with the Bureau of Indian Affairs to establish a counseling center for Native American students. It has evolved into the Center for Tribal Studies (CTS), which is now located in a beautiful 1867 brick building that became the first Indian University in 1880. CTS fulfills a mission that includes staying current with national issues in Indian affairs, acting as a coordinating agency for American Indian students on campus, and providing outreach programs to schools in the fourteen-county area of northeastern Oklahoma.

The Center for Tribal Studies offers programs to assist Native American students by providing symposia, workshops, and lectures. It also serves as a resource for the educational community by coordinating multicultural programs and offering workshops on multicultural awareness, parental involvement, Cherokee language instruction, curricular consultation, and cultural enrichment programs. CTS staff members coordinate the IMPACT (Indian Student Mentoring Program for Academics, Citizenship, and Time Management) program which uses a student honor group, the NSU Foundation Scholars, to influence elementary and secondary students to pursue college and career opportunities. CTS also administers Footprints, a summer camp program for Native American junior high and high school students who excel in science. This program provides opportunities for interaction with Native American role models in science related professions.

The Center for Tribal Studies functions as a resource, referral, and support center with strong ties to Oklahoma's academic community and to the tribal communities located throughout the counties of northeastern Oklahoma. Dr. Morton stressed that NSU's success in working with students who major in science and engineering fields and who may go on to doctoral studies is very much a function of CTS's academic ties and orientation. He believes that efforts by other universities to involve and promote Native American students must be similarly grounded in an academic setting. Dr. Morton emphasizes that university support programs for Native Americans, when based primarily in a social context or organized with a predominantly social emphasis, have limited impact because they are too removed from the academic programs themselves.

According to Dr. Morton, there are no Native American faculty members in the math or science departments at NSU, and therefore the mission of the Center for Tribal Studies is a critical one. If the faculty within each department were left to their own devices, however well meaning and devoted they may be, they would recruit only in the larger cities' school districts and would thereby miss connecting with the majority of Native American students, whose homes are more spread out

among the smaller and poorer towns and counties. CTS staff have exceptional knowledge of the promising students as a result of their hard-earned relationships and connections with the tribal communities. For this reason, CTS can be helpful not only to NSU faculty but in efforts by other universities to recruit and enroll Native American talent (particularly when there is a need to identify talented students for NSF-sponsored programs and the like).

NSU offers freshman-level minority scholarships and various incentives for students enrolled in Education and in Math and Science, especially in the College of Science, Math, and Nursing. CTS promotes a tutorial component which seeks to match students with faculty and peer tutors. Special efforts are also made to involve students in the American Indian Science & Engineering Society (AISES) headquartered in Boulder, Colorado, and in the National Indian Education Association (NIEA). CTS also provides a service to Native American students in search of scholarships, grants, and other financial aid, and makes available a Native American Scholarship Manual.

At this time, there is little involvement of Native American students in research projects at NSU. However, 24 NSU math and science students will soon be involved in a mentoring experience with professors and/or departments at Oklahoma State University, through a cooperative program funded by the National Science Foundation. This relationship was facilitated by CTS's focus on and awareness of particular Native American students who excel in the sciences. Carol Rhoads of CTS is responsible for coordinating and administering the NSU relationship with the OSU/NSF program.

Another cooperative program, overseen by Carol Young of CTS, is the Native American Center of Excellence ASPIRE Program. CTS subcontracts with the University of Oklahoma to work with students, even at the junior high level, to nurture and facilitate their progress through undergraduate scientific preparation, and thereby to increase the number of Native American students applying to medical/dental school .

The Center for Tribal Studies is also active in preparing undergraduates for the completion of the GRE, LSAT, MCAT, and other graduate aptitude examinations through preparatory classes or computer practice modules.

## *Oklahoma State University*

Oklahoma State University, founded in 1890, is a state-supported coeducational research university with a total enrollment of just under 20,000 students, with about 15,000 undergraduates, 87 percent of whom are from Oklahoma and over 1,000 of whom are Native American.

The Multicultural Development & Assessment Center is located on the second floor of the OSU Student Union. The services provided there are intended for other minority populations as well. The reception area and Dr. Croser's office are replete with resources for Native American students and pictures of contemporary Native Americans who are recognizable for their roles in politics, athletics, and entertainment. Dr. Croser stressed that past support by the University president, as well as corporate interest, have made a difference in the amount of funding available and the strength of commitment to Native American students at OSU. He indicated that support from the federal government for specific initiatives was vital and appreciated, but that nothing can replace commitment by the University.

OSU is the recipient of a major National Science Foundation grant for its Center for Native Americans in Science, Engineering, and Mathematics. The program, expected to be funded at $25-26 million over a ten-year period, is designed to increase the number of American Indian students entering science and engineering, and to improve the quality of their experiences. In all probability it will also impact the number of students entering doctoral studies.

The Native American Student Association, a student organization within the Student Government Association, has grown strong and large in recent years. In fact, it now receives the largest amount budgeted to any student organization on the OSU campus. This organization provides an important co-curricular opportunity for students who see very little Native American

presence among the faculty.

OSU has a Native American Studies Program but a dearth of "identifiable" faculty role models who are American Indians. The Native Americans in the Biological Sciences program (NABS) at OSU targets elementary and secondary students and works to recruit and enroll them through scholarship support. Significant strides have also been made in enrolling and supporting Native American engineering students. The University also has a chapter of the nationally based American Indian Science & Engineering Society (AISES), which has become an important connection and support system over the eleven years since its founding at OSU.

Dr. Croser noted that a particular strength in recruiting Native American students in the past has been Native American High School Day, which brought 600 prospective students to campus the last time it was held. He believes that this program and other such efforts to build relationships in the tribal communities and high schools are partly responsible for increasing the total number of Native American students enrolled at OSU from about 350 in the early 1980s to 1,043 this year. However, he is concerned that an administrative decision to combine this special event with campus visitations by all minority prospects on "Multicultural Day" has resulted in lessened attendance.

OSU also offers an out-of-state fee waiver for American Indians which has been a powerful factor in attracting more students from outside of Oklahoma. To encourage students to stay in college, seek support, and identify other sources of financial aid, the Multicultural Development & Assessment Center keeps a thick, well-organized and continuously updated source book entitled "Minority Programs and Services" on the coffee table in the Center. It includes current information on fellowships, scholarships, job openings, grants, and graduate programs available to Native Americans.

## *The University of Oklahoma*

The University of Oklahoma, founded in 1890, is a state-supported coeducational research university with a total enrollment of 19,683 students, with about 15,000 undergraduates, 82 percent of whom are from Oklahoma and over seven percent (about 1,150) of whom are Native American. The University of Oklahoma has made a commitment to recruit and retain Native American students through the establishment of university departments such as American Indian Student Services (AISS) and the grant-funded Native American recruitment office in Minority Recruitment Services. AISS, located in the Office of Student Support Services, provides scholarships, academic support programs, leadership programs, and personal counseling, and serves in an advocacy role on behalf of American Indian students. It sponsors various American Indian student organization projects such as American Indian Heritage Week. In addition, the American Indian Awards Program and American Indian Graduation Ceremony provide special forums for students to be recognized for their accomplishments.

The Minority Engineering Program (MEP) at the University of Oklahoma has, according to its literature, "made more progress than any other program in the nation over the past five years" in its two primary areas of responsibility: recruitment and retention. It is an aggressive program with a heavy emphasis on corresponding with high school personnel, prospective students and their parents by mail and by phone. MEP representatives visit high schools, participate in College Day, initiate correspondence and follow-up, host a high school counselor conference, hold receptions for high school students and their parents in their home cities, and host campus visits by prospective students and their parents.

Since 1988-89, when MEP succeeded in bringing 62 freshmen (including seven National Achievement Scholars) to OU, success has bred success. In Fall 1992, 27 National Achievement Scholars enrolled at OU and 25 of these were engineering students. These figures are helping to put OU near the top or to break national records in selected categories. And phenomenally, the

percentage of MEP students enrolled in OU's College of Engineering has grown from 5.8 in 1983 to 20.2 in 1994. The number of American Indian students enrolled in engineering has increased from 45 in 1986 to 130 in 1994 (Blacks from 62 to 276; Hispanics from 33 to 86). OU is one of the very few universities that has been successful in enrolling significant populations of each of the underrepresented minorities in engineering.

The retention component of the MEP program includes very structured activities for freshmen progressing to a more flexible model for non-freshmen. The activities include a three-hour orientation course each fall; a one-hour orientation course each spring; clustering of freshman level courses; structured group study sessions; regular monitoring of academic progress; an open door advising policy; open tutoring; special advising, counseling and registration in the MEP office; employment assistance, and; mentoring of five freshman engineering students per upperclass engineering student, whose role is to ease the adjustment to college life.

As a result of the Minority Engineering Program, higher proportions of minority students are graduating with cumulative grade point averages above 3.0, and more are seriously considering graduate school. Thirteen of the 27 1993-94 minority engineering graduates achieved at least a 3.0, and eight of these students were seriously considering advanced degrees. But the following excerpt from the MEP evaluation literature is telling: "How many of these students eventually go on to pursue advanced degrees is unknown. It is difficult to turn down employment offers in the mid-forties which most of these students are receiving." However, OU's MEP does carefully track the long-term activities of its graduates and has had success in enrolling them in graduate schools, most recently including Rice, Stanford, OU, and SMU. Outstanding graduates sometimes change their interests and go on to other professions. For example, Dr. Marilyn Grass-Culp, an American Indian named 1987-88 Senior of the Year in the OU College of Engineering graduated with a medical degree in the spring of 1993 and is currently interning in Tulsa. Happily, she has remained a member of the Board of Directors of the immensely successful and important American Indian

Science and Engineering Society (AISES).

The University of Oklahoma offers a number of scholarships to American Indians, some of which require specific behavioral commitments on the part of the recipient. For example, each year 10-15 upperclass American Indian students receive $1,000 stipends in exchange for making phone and personal contact throughout the year with up to twenty American Indian freshmen. Under this program (American Indian Retention Program) the paid Retention Interns are trained in troubleshooting and meet bi-weekly with Mr. Brett Williams, the Assistant Director for Student Support Services. The University Achievement Class (UAC) is a scholarship program designed to highlight outstanding American Indian freshmen and encourage leadership development. Besides a monetary award, students attend required class meetings, a leadership retreat, and study hall. In turn, they receive early registration privileges and special advising services during the freshman year.

The American Indian Non-resident Tuition Waiver requires documentation of affiliation with one of the federally recognized American Indian tribes in Oklahoma. The scholarship provides up to $3,200 in tuition waiver as long as the student remains in good academic standing, for up to four years. The Passage to Progress program recognizes outstanding American Indian transfer students who may be required to participate in recruiting other transfer students in exchange for a $1,000 tuition/fee waiver.

The Jim Thorpe Multi-Cultural Center is located in the heart of the campus and is a focal point for American Indian students. Various student organizations use the Center, a three-story structure with office space, kitchen/dining facilities, and conference room, for social and fund-raising activities.

The American Indian Alumni Society (AIAS) is a very active network of OU graduates and friends of the Society. For the past two years AIAS has co-sponsored American Indian Visitation Day, a highly successful recruitment tool. The American Indian Employee Council (AIEC) at OU

has established a mentoring program to assist at-risk students. There are at present at least seven American Indian student organizations, including a chapter of the American Indian Science and Engineering Society (AISES), which meet throughout the year and are encouraged to take part in American Indian Heritage Week.

Supplemental instruction for Native American students is funded by the Native American Center of Excellence at the OU Health Sciences Center. It seeks to assist American Indians enrolled in Introduction to Zoology and General Chemistry. The paid SI Leaders are students who have completed these courses with high marks; they hold three weekly sessions designed to enhance students' understanding of the concepts and processes used in zoology and chemistry. SI is part of a larger initiative to encourage American Indian students to enter careers in Dentistry and Medicine.

Project Threshold offers free tutoring to American Indian students in any subject. Mr. Williams stated that the OU "formula for success" in enrolling and retaining American Indians is strong organizational development, evidenced by direct institutional funding of related student services.

## *SUMMARY*

Several themes were apparent within the information gathered from these three universities. It was evident that colleges and universities involved in efforts to increase the number of Native American students who major in science and engineering and then go on to graduate studies in science and engineering face formidable obstacles. However, the comments of the persons we interviewed were immensely insightful and instructive, and were grounded in experiences that are characterized by trial and error, retrial, and rededication.

According to the persons we interviewed, efforts to recruit and retain Native American students must be backed up by a strong commitment from the university's top leaders, including the senior executive officer. Our interviewees said that no single factor made more of a difference than

institutional commitment. They advised us that grants come and go, as do legislators who usually have their minds on other issues or do not value the academic enterprise, much less commit themselves to minority initiatives.

A second theme was to seek ways to build meaningful relationships in tribal communities and high schools, and that it is essential that related pre-collegiate programs continue to be designed and implemented even at the grade school level. Students must be encouraged at a very young age to think of the scientific enterprise in wondrous and non-threatening images, and to believe that they can achieve in the mathematical and scientific coursework required for related careers. They need to see successful role models who are physically identifiable as American Indians, and they must be intellectually challenged and academically supported well before entering college. Several stories were told about students who wanted with all their hearts to become doctors or engineers, but for whom remedial coursework was necessary and for whom "making up lost time" meant losing the grade point averages needed to enter a particular program of study.

A third theme was the importance of placing recruitment of Native American students within an academic context and searching "close-up" within the smaller and largely isolated communities in which so many Native American pupils live. It is not enough for admissions personnel or faculty within a particular department to recruit within the largest known "feeder" schools. It is necessary for people who work closely with and network within tribal communities to provide the names or conduct the site visits or make the phone calls or write the special letters.

A fourth theme was the importance of finding appropriate role models for students to connect with on campus. These must include other Native Americans who have leadership positions on campus, as well as mentors and researchers in the departments and laboratories. Unfortunately, the ideal combination of Native American faculty members who are faculty in the science and engineering programs are in very short supply.

A fifth theme was the strong competition for promising Native American college students in

other disciplines. Although the ultimate purpose of this study is to increase the number of minorities who finish doctoral studies in science and engineering and then dedicate themselves to college teaching, many of the same people who encourage and support these young people want to see them make lots of money, most often in legal or medical professions. This simply underscores the need to expand the available pool of academically prepared students by doing a better job of educating and encouraging them in the early years.

A sixth theme was the importance of building strong campus initiatives, based in academic units, that include recruitment, retention, and tracking mechanisms. The best example we came across was the Minority Engineering Program at the University of Oklahoma.

A final, important theme involved the commitment of national initiatives to the success of the American Indian community in science and engineering. It was evident at each school that the efforts of two organizations, the American Indian Science & Engineering Society (AISES) and the National Science Foundation (NSF), were instrumental and far-reaching. Although we know a great deal about NSF and its valiant efforts over the years, we knew little about AISES prior to this study. Each of the three schools visited has had a campus chapter of AISES (pronounced "aces") for about ten years, and each remarked about the way these chapters have "really taken off" in recent years.

The AISES national office is located at 1630 30th Street, Suite 130, Boulder, CO 80301 (telephone 303-939-0023). This extraordinary organization encourages students, teachers, counselors, advisors, all American Indians, and friends in corporations, governments and foundations "to join...to participate...to give...to give-back" in the interest of improving the number and quality of experiences available for American Indians entering science and engineering. AISES administers the following programs and services: hosts a national American Indian Science Fair (grades 5-12) to encourage students to pursue science and mathematics; sponsors pre-college summer programs on college campuses; organizes an annual teacher enhancement and curriculum

development seminar; sponsors local pre-college AISES clubs and chapters; sponsors college level AISES chapters; awards over $500,000 in scholarships to hundreds of students; publishes Winds of Change magazine, a superior publication including an Annual College Guide for American Indians, and; organizes an annual national conference for over 2,500 participants.

In summary, then, these are the lessons gained from our study of universities that are successful in enrolling and graduating American Indian students in science and engineering:

- Obtain strong commitment from the university's top leaders.
- Build meaningful, ongoing relationships in tribal communities and schools.
- Place recruitment of Native American students within an academic context and search "close-up" within all Native American communities.
- Find and support appropriate role models and mentors for students to connect with on campus. Student services departments can be particularly helpful in this regard.
- Anticipate and meet strong competition for promising Native American college students in other disciplines head on.
- Design and continuously improve campus initiatives, based in academic units, that include recruitment, retention, and tracking components.
- Take advantage of national initiatives designed to enhance the success of American Indian Students in science and engineering.

## *Site Visit Report: Howard University*

### *William F. Brazziel*

Howard University ranked first among the listings of colleges of baccalaureate origins for black recipients of science and engineering doctorates for the period under study: 1988-93. A total of 89 black S&E doctorate recipients listed Howard as their college of baccalaureate origin for this period. Howard is a Research I University with strong programs in the life sciences. A Howard alumnus developed synthetic cortisone. Another pioneered open heart surgery and yet another developed blood plasma. Howard was established by the Freedmen's Bureau in 1869. Its first president was a Union general. About 85 percent of its students are black Americans. Howard also enrolls students from some 80 foreign countries.

Howard depends heavily on alumni to send their sons and daughters into its science and engineering programs. This faith in alumni and school loyalty serves them well. Dr. Clarence Lee, Dean of Arts and Sciences noted that the story of a Seattle father telling his son he could go to college anywhere he wanted, but that the check was going to Howard, is not entirely apocryphral. Howard also gains many students through its reputation and its location in our nation's capital. Every state is well represented at Howard.

In a wide-ranging meeting with science and engineering faculty, the following were identified as key factors in the success of students when they come to Howard:

- **Dedicated Professors**: professors for whom much of life's satisfactions come from the successes of their graduates as doctoral starts, doctoral recipients and doctoral achievers.
- **Cultural Comfort**: students see many people like themselves on campus and have to spend little time and energy trying to fit in. Or deal with misunderstandings.
- **A Plethora of Role Models**: students see many successful people like they want to be.

Homecoming, Graduation Days, and other "big days" on campus are seized upon as the opportunity to involve successful Howard graduates with S&E doctorates in work with undergraduates.

- **Mentoring:** "kids don't get lost at Howard" is a motto, it seems. Every undergraduate is assigned a mentor on the first day of orientation and this individual becomes the source of advice and encouragement throughout his/her undergraduate career at Howard.

- **Problem Solving Seminars**: freewheeling seminars where students tackle the knottiest problems of the classes the seminars address and faculty are invited in to help render the concepts crystal clear. Teaches problem solving techniques and value of collaboration.

- **Bridge Programs for B Students:** while bridge programs are usually developed for students who might need assistance on some topics, Howard encourages students with B averages to enroll in Bridge programs designed to turn them into A students. Students undergo a complete study habits, time management audit along with an audit of skills needed at their levels. They are shown how good nutrition, regular hours and better organization can bring the As they will need for graduate school entry.

- **Undergraduate Research**. students are encouraged to work with faculty members in their laboratories and to take internships and summer jobs in the many government laboratories in the Washington, DC area, e.g, National Institutes of Health. Goddard Space Center, U.S. Department of Agriculture. The record of Ms. Jennifer Kaye Jones offers a good case in point. Ms Jones entered Howard's graduate chemistry program in 1991. A graduate of Talladega College Ms. Jones spent every summer working as a researcher in Talladega's labs, e.g., invitro fertilization experiments with sea urchins, identification of the rate of growth among L-cells in cancer patients. Her work was funded by the NIH-MARC program described above in the initiatives compendium.

- **Making Good Use of the New Calculus:** This new thrust in mathematics is removing an historical stumbling block on many campuses. Howard has embraced the thrust with open arms.

- **Making Good Use of Academic Societies:** Students are urged to become active in Beta

Kappa Chi and Sigma Xi and to present at local, regional, and national meetings. Both are honor societies for S&E. The Society of Toxicity also involves the energies of many Howard students as does chapters of the American Chemical Society, the NOBCChe (National Organization for the Professional Advancement of Black Chemists and Chemical Engineers) and the Society of Black Physics Students.

- **Making Good Use of Government Programs:** professors and administrators put in proposals for all available grants from the government, foundations and private benefactors to enrich the academic life of Howard S&E students. Presently, Howard has grants from NIH to support students in a MARC program (Minority Access to Research Careers) which was described earlier. The Howard Hughes Foundation also supports Howard students headed to careers in biomedical research. Funds from these programs are invaluable in supporting undergraduate research, internships in off-campus agencies and attendance at regional and national meetings. Howard also has an NSF grant to support undergraduate research under NSF's RCMS program (Research Careers for Minority Scholars) and NIH's MBRC (Minority Biomedical Research Support).

- **Making Good Use of Corporate Opportunities:** Howard works closely with Monsanto, CITGO, EXXON, AT&T, TEXACO, American Cyanamid, Chevron, DuPont, Eastman Kodak, and Eli Lily, among others. This means summer jobs and research internships.

- **Helping students line up graduate assistantships and other aid for graduate study.**

- **Helping students prepare for and do well on the GRE exams.**

- **Follow-up of alumni and use of feedback to improve S&E programs.**

Howard has joined with others to address the problem of undersupply of minority precollege science and engineering students in the pipeline. They are now an integral and important member of the large AMP (Alliance for Minority Participation) serving the Washington, -- Baltimore - Hampton Roads area. Institutions in the AMP consist of Howard, Morgan State University of Baltimore, Hampton University of Virginia and the University of the District of Columbia. The AMP

mounts initiatives ranging from Head Start science camps to summer research for high school students in Howard's Center for Extra-Terrestrial Studies, all aimed at getting more high ability students into - and out of - the S&E pipeline. The AMP is also attempting to spur honors programs and more S&E students in community colleges.

## *Themes*

Several themes run through the report of Howard's effort, some of which might be useful for colleges and universities wishing to increase minority S&E doctoral starts. Predictably, the first is total commitment on the part of all involved. Second, a certain psychological involvement on the part of professors. This may not be as difficult to engender as it may sound. Most faculty members derive feelings of accomplishment from having produced a good student. Producing scores of high achieving minority S&E doctorates will appeal to many professors.

Recruiting good students is a given on any campus and in any program. Howard is fortunate to have a large, strong and loyal alumni. As seen elsewhere in these reports, universities without large numbers of minority alumni can develop strong ties with feeder colleges elsewhere and accomplish much the same thing as Howard. The strong relationships between Cornell University and Radio Telescope of Puerto Rico is a case in point. The relationship assures a steady stream of well-educated Puerto-Rican S&E doctoral starts. See the Cornell site vist report.

Colleges and universities would do well to invest time, money and effort in the establishment of minority professional and honor societies as Howard did and as the Oklahoma universities did in working with Indian S&E students. These groups open up the professional worlds for minority students and as such are empowering to the greatest extent.

Professionalizing the student to the greatest extent possible was evident in Howard's involvement of students in undergraduate research, both on campus and in off-campus locations. Reporting to the laboratories as an assistant in a graduate programs becomes second nature here.

Helping the student take the next step after graduation. e.g., line up the graduate assistantship, do well on the GREs, cut the umbilical cord and go off to grad school can be seen in Howard's efforts to prep students for all of these endeavors.

The most important theme may be the realization of the faculty and administrators at Howard that expansion of the numbers of minority S&E students is totally necessary and that they must join forces with others to expose more minority children and youth to S&E and to identify and conserve S&E talent until these young people reach campuses. The evidence of this realization is the decision of Howard to become an integral part of an alliance of universities, corporations, government agencies and civic groups all committed to expansion of minority participation in science and engineering, the Washington-Baltimore-Hampton Roads AMP. This is a decision worthy of emulation anywhere in the country.

## *Site Visit Report: Morgan State University*

## *Mamye BaCote*

Morgan State University is an historically black institution with the unique designation as Maryland's public urban university. As an urban university, Morgan serves an ethnically and culturally diverse student body, among which are some of Maryland's best and brightest students as well as representative numbers of high school graduates from urban communities who would not otherwise pursue the baccalaureate degree. Similarly, the student body reflects the traditional college-going cohort as well as part-time adult learners.

The University's curricula are designed to meet the educational needs of city residents and the needs of the city and state for professionals trained in a variety of areas. Academic offerings consist of major programs in the arts and humanities, the social sciences, science, engineering, education, business and a selected number of professional areas. A major focus of the curriculum is on the social, economic and political characteristics of the city so that the capacity to understand urban life and phenomena is a central part of the education of the students. The comprehensiveness to understand urban life and phenomena is a central part of the education of the students. Also, this comprehensiveness of Morgan's programs reflects the commitment of the University to have a major impact upon the problems of the under-representation of blacks and other minorities in the professional labor force of science and engineering within the city, state and the nation.

Consistent with the diversity of the student body, the University has as supplements to the standard curriculum an honors program for high academic achievers and a network of academic enrichment programs, academic advising and counseling services for students needing special assistance. Also, it employs a variety of methodologies, pedagogic approaches, and delivery systems which facilitate achievement among traditional and non-traditional students, at on-campus

and off-campus sites.

The research program of the University involves both basic and applied research. Because of the urban emphasis however, a substantial amount of research is focused on urban life and phenomena with a bent toward education, service and public policy development. The research is oftentimes oriented toward specific urban problems and issues such as human resource development, economic development and competitiveness, health care, environment, transportation, aging, and substance abuse.

In fulfilling its service function, Morgan is committed to serving the professional communities represented by its academic programs, while also assisting local government, local businesses and community groups in addressing the problems they face in urban Baltimore. Special attention is given to in-service training for public school teachers and enrichment programs and counseling services for students who would not otherwise have an opportunity for pursuing college study. Likewise, the University seeks to promote economic development through its partnerships with business and industry and its focus on minority business development. Finally, Morgan serves as an important cultural and intellectual center for a major segment of the community and contributes much to improving the quality of life for citizens throughout the Greater Baltimore Community.

**Morgan State Science History/Recruitment and Retention**

The involvement of MSU in science and math initiatives has been in existence for many years, even to the inception of MSU. Established as a free black institution in 1867 it saw the need to instruct blacks in the hands-on laboratory aspects of science at the college level.

Morgan State University has begun to pursue initiatives that would prepare its students to become active participants in the scientific enterprise in the United States through entry into industrial positions, pursuit of professional health care training and graduate training leading to the Ph.D. Biomedical Research has been an emphasis in the science and engineering departments at MSU. The engineering department is divided into three categories: chemical, electrical, and

industrial. All receive a variety of funding from federal government agencies, such as the National Institutes of Health, the Department of Energy, the Environmental Protection Agency, the U.S. Geological Survey, the National Science Foundation, the National Aeronautics and Space Administration, and the Department of Education.

Additionally, funding support from private companies, philanthropist and national research laboratories have expanded Morgan's efforts in the sciences, mathematics, and engineering.

**Special Initiatives for S&E Minority Students**

The types of activities that are conducted through Morgan State University's science and engineering departments support student recruitment, retention, and programmatic enrichment. These activities run the range of support initiatives, which include not only college undergraduate students, but places a heavy concentration on students in the public schools (K-12). More specifically, in the area of student **recruitment**, the following initiatives have been undertaken:

- the operation of pre-college programs spanning the elementary through high school range.

  Example #1:

  In 1992, Morgan State University, in partnership with other educational institutions and public and private sectors, entered into a five year Cooperative Agreement with the National Science Foundation (NSF) to implement a Comprehensive Regional Center for Minorities (CRCM) program in Baltimore. The Baltimore CRCM program, named SEMPREP (Science, Engineering and Mathematics Precollege Preparation), is a precollege intervention program for Baltimore city public schools K-12th grade students, their parent, and science and mathematics teachers. SEMPREP's objective is to simulate systemic changes in mathematics and science teaching and learning in a way that results in long term increases in the number of minority youth who complete high school academically prepared and motivated to pursue science, engineering and mathematics career course in college.

SEMPREP activities are divided into three categories: academic preparation which included student science seminars, summer mathematics/science programs, S.A.T. preparation classes, bridge-transition programs and science mathematics learning centers; teacher enhancement which includes in-service teacher training, elementary teacher workshops and classroom instructional assistance; and informal education which includes awareness symposia, MESA and ACE clubs, 3-T Mentoring, science trek, science and technology fairs and engineering education days. This comprehensive program of activities addresses students, teachers and parents at all points along the educational pipeline. See Appendix B for student reports on SEMPREP.

Example #2:

The Howard Hughes Biomedical Research Training Program has been developed at Morgan State University through the efforts of an interdisciplinary task force, to increase the number of minority students entering biomedical science careers.

The program is designed to provide career exposure, academic enrichment and motivation for middle and high school students in grade levels 9 through 12 in the Baltimore area. Training for secondary school science and mathematics teachers is also an important aspect of this program.

Example #3:

The Morgan Undergraduate Chemist Help (MUCH) Program in Science and Mathematics is a collaborative project between the Morgan State University College of Arts and Sciences Chemistry Department and the Baltimore city public schools .

Example #4:

Morgan State University's School of Engineering, in cooperation with Southwestern High School established an outreach program in 1992. The primary goal of this program is to combat the decreasing interest in engineering, mathematics, and other science related

careers within the economically disadvantaged families. This program is incorporated and funded under the Outreach section of the ECSEL program.

Example #5:

Morgan State University's School of Engineering has developed a unique three week summer program designed to provide talented high school students with an exposure to the rigor and challenge of engineering and science education. This program, Pre-College Career Exploration in Engineering and Science, was started in 1988. It is targeted to 10th grade students primarily in the Baltimore-Washington area. The total population served to date is 172 with 32 students presently participating. The total purpose of the program is to encourage students to consider college studies in the challenging fields of engineering and science after completion of high school.

- advertisement of MSU science programs at national meetings.
- use of national alumni organizations as primary contact sources.
- the active involvement of faculty in recruitment trips made by the University's admission office.
- making widely known the accreditation status of Morgan's programs.
- the inclusion of high school students in minority scientific honor society activities.
- the inclusion in nearly all proposal, funds to support undergraduate and graduate students; and even funds to support activities for public school students and teachers.
- making known MSU's trend towards creating a "family-type" campus environment that is personally supportive and very conducive to learning.

In regard to **retention** the following strategies are effectively used:

- the majority of the science faculty serves as mentors for undergraduate students.
- the expertise of accomplished alumni is frequently called upon in regard to assistance with and/or participation in seminars, workshops, and other aspects of campus life. Mentors serve as sponsors

of Pre-College programs, SEMPREP (Science Engineering and Math Pre-College Preparation).

- some departments have special "bridge" programs which allow those entering students who have weaker science and mathematics background to strengthen their academic skills so that they might be able to handle a rigorous curriculum.
- departments have well organized academic advisement mechanisms.
- there are departmental clubs/organizations that provide for meaningful interaction of students and faculty.
- some departments hold special forums and work sessions for those students who have shown significant signs of underachievement.

In regard to academic **enrichment** the following strategies are applied:

- Many internships and co-op experiences are provided with major universities (Howard, University of Maryland-College Park, Penn State, MIT, University of Washington, DC and City College of New York).
- MARC-HURT - a unique Undergraduate Honors Research Training Program in Biology, Chemistry, Physics & Psychology at Morgan State University designed to prepare enrollees for graduate study toward the Ph.D. degree in Biomedical Sciences - involves many students.
- effort is made to get as many students as possible involved in active research (with or without financial support).
- students have an opportunity to work with state-of-the-art equipment.
- there is active mentoring by outstanding alumni.
- some departments provide special courses and seminars focusing on preparing for graduate school/professional school entrance exams (GEE, MAT, and others).
- there are a number of consortia relationships with other universities; John Hopkins, Hampton University and the University of Maryland-College Park.
- there are special courses and seminars concentrating on the methods of dealing with technical

information.

- Alliance for Minority Partnership - a one million dollar National Science Foundation Grant with four schools; Howard, University of DC, Hampton University and Morgan State University - provides for a variety of pre-college enrichment programs including the new calculus and undergraduate research.

## *Site Visit Report: Hampton University*

***Mamye BaCote***

Hampton University, founded in 1868, is located on 204 acres of Virginia's Peninsula. It is a privately endowed, co-educational, nonsectarian institution of higher education with accreditation by the Southern Association of Colleges and Schools and the Department of Education of the Commonwealth of Virginia. The University holds membership in the Council of Graduate Schools, the Council of Independent Colleges in Virginia, the Universities Space Research Association, and the American Council on Education; and its programs in chemical and electrical engineering, nursing, music, architecture, communicative sciences and disorders, computer science, and teacher education are accredited by the Accreditation Board of Engineering Technology, the National League for Nursing, the National Association of Schools of Music, the National Architectural Accrediting Board, the American Speech-Language-Hearing Association, the Computing Sciences Accreditation Board, Inc., and the National Council for Accreditation of Teacher Education, respectively. The chemistry program is approved by the Committee on Professional Training of the American Chemical Society.

Currently, the University has an enrollment of 5,769 students drawn from 112 states, territories and foreign countries. The faculty numbers 350. The University is organized into four colleges: Hampton Institute, the Undergraduate College; the Graduate College: the College of Health, and College of Continuing Education. The Undergraduate College has three schools: Business, Liberal Arts and Education, and Pure and Applied Sciences. Within these schools and the College of Health, the bachelor's degree (B.A., B.S., or B. Arch.) in 23 fields among which are biology, chemistry, physics, applied mathematics, environmental science, communicative sciences and disorders, nursing, museum studies, counseling, computer education, computer science, business administration and management. The College of Health, established in January 1994,

includes the School of Nursing and the Department of Communicative Sciences and Disorders. Two new academic programs, physical therapy and pharmacy, are under development. The College of Continuing Education offers programs leading to non-traditional degrees in six areas: fire administration, emergency medical management, paralegal studies, systems organization and management, business management and general studies.

**Hampton University Science History**

The involvement of Hampton University in science and mathematics initiatives goes back many years, even to the point in American History when the active, hands-on, laboratory aspects of science instruction at the college level was just beginning. This period of time is around the 1870's to early 1900's. Most recently this early involvement of Hampton University in real laboratory science instruction has been documented in a new permanent exhibit entitled "Science in American Life: at the Smithsonian's National Museum of American History.

In regard to more recent times, since the early 1960's until today, Hampton University has vigorously pursued initiatives that would prepare its students to become active participants in the scientific enterprise in the United States through entry into industrial positions, pursuit of professional health care training, and graduate training leading to the Ph.D. Over the past decade, a heightened emphasis had been placed on Hampton University graduates entering graduate programs leading to the doctorate. As a means of preparing and encouraging its majors in the pure and applied sciences, a variety of funding opportunities from federal government agencies, such as the National Institutes of Health, the Department of Energy, the Environmental Protection Agency, the U.S. Geological Survey, the National Science Foundation, the National Aeronautics and Space Administration, and the Department of Education, to name a few, have been successfully pursued. Additionally, funding support from private companies, philanthropist and the national research laboratories have augmented our efforts in the sciences, mathematics, and engineering.

**Special Initiatives at Hampton University**

The types of activities that are conducted through Hampton University's School of Pure and Applied Sciences support student recruitment, retention, and programmatic enrichment. These activities run the gamut of support initiatives, which include not only college undergraduate and graduate students, but also encompass students in the public schools (K-12). More specifically, in the area of student **recruitment,** the following initiatives have been undertaken:

- the operation of pre-college programs spanning the elementary through high school range.
- advertisement of HU science programs at national meetings.
- use of national alumni organizations as primary contact sources.
- the active involvement of faculty in recruitment trips made by the University's admissions office.
- making widely known the accreditation status of Hampton's programs.
- the inclusion of high school students in minority scientific honor society activities.
- the inclusion in nearly all proposas, I funds to support undergraduate and graduate students, and even funds to support activities for public school students and teachers.
- making known HU's trend towards creating a "family-type" campus environment that is personally supportive and very conducive to learning.

In regard to **retention** the following strategies are effectively used:

- the majority of the science faculty serves as mentors for graduate and undergraduate students.
- the expertise of accomplished alumni is frequently called upon in regard to assistance with and/or participation in seminars, workshops, and other aspects of campus life.
- some departments have special "bridge" programs which allow those entering students who have weaker science and mathematics backgrounds to strengthen their academic skills so that they might be able to handle a rigorous curriculum.
- departments have well organized academic advisement mechanisms.

- there are departmental clubs/organizations that provide for meaningful interaction of students and faculty.
- many departments have established departmental comprehensive exams and other requirements that ensure quality control and the ability to identify those students who are not performing to their full potential.
- some departments hold special forums and work sessions for those students who have shown significant signs of underachievement.

In regard to academic **enrichment** the following strategies are applied:

- many internship & co-op experiences are provided (optional or required).
- effort is made to get as many students as possible involved in active research (with or without financial support).
- students have an opportunity to work with state-of-the-art equipment.
- The Honors College is an integral part of the HU undergraduate program.
- HU has a variety of cooperative agreements with major universities (Michigan State, Boston University, Virginia Tech, the University of Virginia, the Medical College of Virginia, Eastern Virginia Medical School, as well as others).
- there is active mentoring by outstanding alumni.
- some departments provide special courses and seminars focusing on preparing for the graduate school/professional school entrance exams (GRE, MCAT, and others).
- departments routinely take students, especially juniors and seniors, to site visit graduate schools throughout the United States.
- there are a number of consortial relationships with other universities.
- there are special courses and seminars concentrating on the methods of dealing with technical information.

# *Site Visit Report: The University of Maryland, College Park*

## *Janice Hamilton Outtz*

Introduction

The University of Maryland was founded in 1859 as the Maryland Agricultural College. Its purpose was to educate the sons of Maryland farmers and to cultivate the free flow of ideas. After the Civil War, the College became one of the nation's first land-grant colleges under the Morrill Act of 1867. By 1900, the College had begun to prosper and expanded its offerings to include business, engineering and liberal arts. In 1912, women were admitted and by 1920, the name was changed to the University of Maryland.

The university, like the state of which it was a part, was segregated by race and barred African Americans from attending the College Park campus. In 1950, a successful lawsuit required the university to allow a young African American man, Parren Mitchell of Baltimore, to attend graduate classes. The following year, the first African American undergraduate, Hiram Whittle, also from Baltimore, was admitted. It was not until the 1954 landmark Supreme Court ruling in Brown v. Board of Education that the University of Maryland Board of Regents agreed to accept all qualified students without regard to race.

The university continued to prosper as it expanded curriculum offerings into new areas, such as Afro-American studies, Women's studies and Urban studies. In 1988, the General Assembly of Maryland in a historic act designated the University of Maryland at College Park as the flagship institution for the newly-expanded University of Maryland System (excerpted from the *1994-95 University of Maryland at College Park Undergraduate Catalog*).

**Background on Science and Engineering Programs**

The College of Computer, Mathematical and Physical Sciences states in its admission catalog that the "college is strongly committed to making studies in the sciences available to all despite their background. In particular, the college is actively pursuing an affirmative action program to rectify the present under-representation of women and minorities in these fields. There are in fact many career opportunities for women and members of minorities in the fields represented by the college." The College of Engineering made no similar statement in its admission catalog, but did include the statement that "Minority and women students are encouraged to apply for admission."

**Formula for Success**

The University of Maryland's "formula for success" in producing minority science and engineering baccalaureates who go on to doctoral study is multi-dimensional and involves several different programs and support services:

Undergraduate:

- the *Young Scholars Summer Program* for students between their Junior and Senior year of High School is designed to introduce high school students to engineering and computer science. Students earn six college credits toward an engineering degree during the program.
- the *Bridge Program* for entering first year students engineering students. The program is operated in the second summer session. Students complete English 101, review math and complete a study skills course. Orientation to a college campus and four credits toward an engineering degree is earned.
- the Center for Minorities in Science and Engineering provides a complete package of services designed to help students from pre-college through the completion of the undergraduate degree. The services include: climate, academic advising, tutoring support, scholarship information, the *Mentor Program,* outreach programs, job information, counseling and support of student

organizations.

- the School of Engineering tutoring support is available to all students.
- the Student Study Center is available to all students.
- the Undergraduate Student Affairs office offers counseling, advising, etc. to all students.
- the Limited Enrollment Program (for the College of Engineering) is designed to limit enrollment to maintain quality programs. The admission standards for this program are higher than general admission and require a review when the students complete 45 college credits.
- conditional admittance is available for students who are not admitted directly to the engineering program. Students are permitted to attempt up to 24 credits and show sufficient academic capability.

Graduate Education::

- students are provided with financial support for up to two years to complete a M.S. in Engineering and a total of five years to complete a doctorate in Engineering.
- efforts are made to ensure that minority students have office space and an advisor by the end of the first semester in graduate school.
- the Director for Minority Graduate Student Education, School of Engineering, (a new position created in 1991), provides additional advising and support to minority graduate students.

Minority Ph.D. production in Engineering has been low at the University of Maryland. There has been only one since the late seventies. However, there are six in the pipeline that should complete degree requirements in the next two years. Minority graduate students have increased from 36 in 1991 to 76 in 1995. In Spring 1994, there were 14 M.S. and one Ph.D. minority graduates.

There has been an increase in full time minority faculty in the College of Engineering from one in 1988 to six in 1995.

**Recruiting**

Recruiting is primarily focused on high schools with science and technology college preparation curricula. The university participates in high school college fairs, the "women in engineering" program which focuses mostly on minority women, and a "visit Maryland day," which the university holds for prospective college students in all departments and which culminates with a lunch for all of the students attending. The university also works closely with high school guidance counselors in over 500 high schools. Because of financial constraints, there is no outreach done below the high school level.

**Special Scholarships/Fellowships**

The Benjamin Banneker and the Francis Scott Key scholarships are available to a small number of entering first year students. (The Banneker scholarship was until recently opened to exceptional African American students. A recent Supreme Court ruling determined that the scholarship could no longer be opened to just minority students. The Key scholarship is also opened to the brightest high school seniors identified. Both the Banneker/Key scholarships are now open to students in all majors and races.) Other scholarships are also available at the University of Maryland campus.

There are 39 departmental scholarships under the Dean's office in the College of Engineering available to all engineering students and a smaller number of scholarships under specific areas, e.g., chemical engineering, mechanical engineering, fire protection engineering, aerospace engineering. These scholarships are available competitively to all students.

**Mentors**

There is a campus-wide mentorship program with active faculty and staff participation and a mentor program operated under the Center for Minorities in Science and Engineering.

**Scholarly Meetings**

The College of Engineering provides expenses and supplements+ expenses as required to ensure that African American undergraduates attend pertinent conferences and meetings. African

American faculty at the university are also provided with stipends to attend conferences and meetings.

**Research Projects**

African American students are involved in research projects at the University of Maryland. Specifically, there are two summer research programs for African American science and technology undergraduates. The Minority Scholars Program in Computer Science and Engineering is a six-week summer program for high school students who have completed their junior year. This program allows the students to live on campus (alternating between the University of Maryland and Howard University in Washington, D.C.) and take courses at both institutions. As part of their course assignments students are given a topic that is very much related to what engineers do and they have to design, construct and test their project. One example is a windmill that generates energy. Students can earn up to two college-level course credits (six semester hours).

The other program is BRIDGE. This summer program is opened to high school graduates who are coming to the University of Maryland in the fall and have expressed an interest in science and engineering. The students can earn up to four college credits and take courses in English and math. This program also involves some aspect of getting to know the engineering field. Field trips are a part of the summer program for students. In addition, the faculty also provides recommendations for student participation in other summer programs across the Nation.

**GRE Preparation**

The University of Maryland does not operate preparatory experiences for the GRE for African American undergraduates (or any other students). Students are encouraged, however, to enroll in one of the many review courses offered in the local area.

**Scholarship Assistance**

The University of Maryland does offer assistance to students with identifying scholarships, fellowships and assistantships for graduate study. Undergraduate junior and senior students are

invited to a meeting in the fall and provided with information on scholarships, fellowships and assistantships. They are also given support and assistance on completing the applications.

**African American Alumni Role Models**

The University does not use African American alumni as role models. They do, however, use graduate students at the doctoral and masters level as role models for undergraduates.

**Special Funding**

The University does receive special funding to support efforts to increase African American participation in science and engineering doctoral study. The university provides fellowships and grants competitively to all students. They also participate in the GEM program (Graduate Engineering Minority), which is a program sponsored by corporations and provides minority students (African American, Hispanic and Native American) a three-semester stipend to pursue a graduate degree ($3,000 per semester plus $750 toward their tuition). The University of Maryland matches the GEM stipend and waives the balance of the tuition for GEM students. GEM students therefore receive $12,000 for the academic year. In addition, the corporate sponsor provides some summer employment after completion of a couple of years and full time employment after completion of the degree. Since most students do not complete the degree in three semesters, the University is committed to providing additional support for the fourth semester.

There is also a one-time $10,000 stipend for a Ph.D. student. After the first year, the University of Maryland provides additional support until the student has completed the requirements for the degree.

The university also participates in the NSF block grant program and the NSF Traineeship Program. The block grant program provides fellowships ($15,000/year) for minority graduate students with a 3.5 GPA to study science and engineering for up to five years.

The Traineeship program (in machine tools) is opened to all students in the Ph.D. program. The university provides financial support for minorities in five of the nine slots available in the

Traineeship program.

**Special Organizational Structures**

There are several special organizational structures on the University of Maryland's campus that might be helpful in sending many black and Hispanic science and engineering graduates on to doctoral study. They include: the Hispanic Professional Engineer's Society, the Center for Minorities in Science and Engineering, the Black Engineer's Society, the Society of Women Engineers and being a GEM participant.

**Other comments:**

The University of Maryland admittedly has gone through great lengths regarding diversity on the College Park campus, but still has much work left to be done. The most obvious barrier to recruiting minority science and engineering students reportedly was lack of minority faculty. Of the more than 2,000 full-time faculty, only 68 are tenured minority faculty.

Also, there are "climate issues" seen as a barrier. African American students in particular often express that it is hard to get a "feeling of belonging." A recent report by the university's Asian, Hispanic and Native American Task Force, noted that one-third of the nonwhite students report hostility on the campus. (There are more than 33,000 students enrolled at the university.)

The university sponsors a week long program on diversity initiatives but the program is reported not to be particularly focused. There are no "diversity training programs" on the campus.

When asked what generally could be attributed to the University of Maryland's success with graduating minority students in the sciences, the response was that students are better prepared. The University does not have many remedial services, so the better students are the ones that come to the University.

# *Site Visit Report: The University of Maryland Baltimore County*

## *Mamye BaCote*

The University of Maryland Baltimore County is a member institution of the University of Maryland System, which is composed of eleven degree granting institutions and ranks among the top ten largest state university systems in the United States. Founded in 1966, UMBC is the public research university for the Greater Baltimore region, enrolling 10,600 students in 38 undergraduate, 25 masters and 18 doctoral programs in the arts, sciences and engineering. Its suburban location on 500 wooded acres in view of downtown Baltimore and 35 miles north of Washington, D.C. offers the programs and facilities of a larger institution with the flexibility and intimacy of a much smaller campus.

Recognized particularly for the strength of its focused graduate and research programs in science, engineering, and public policy, UMBC continues to become increasingly selective in its undergraduate admissions (SAT scores are approaching 1100 and have increased by 148 points since 1986), UMBC also is growing substantially in its graduate and research productivity (83 Ph.D. degrees were awarded the past two years, compared to 54 the previous two years, and sponsored research is expected to reach $30 million this year, up 43% over this past year's $21 million total).

UMBC is a mid-size public research university distinguished by a deep commitment to the educational experience of undergraduates. All full-time faculty teach undergraduates in programs anchored in the liberal arts and sciences, and opportunities abound for student involvement in faculty research. Students' academic experience is further enriched by the Honors College, with its challenging curriculum, small classes and close interaction between faculty and students. The Shiver Center also offers a variety of professional internships and community service opportunities, both locally and abroad.

A part of the UMBC curriculum for the last 28 years, UMBC summer session offers undergraduate and graduate credit courses for those who want to make the best use of their time by taking classes year round or to brush-up in a particular area. Summer courses range from one to four credits and vary in length from four to eight weeks. There are over 400 courses offered in a variety of formats, both during the day and evening, to meet the needs of traditional students and working adults wishing to enhance their personal or professional development.

**The Meyerhoff Initiative**

The involvement of UMBC in science and engineering initiatives goes back to the inception of the University in 1966. Realizing that the nation suffers a general shortage of scientists and engineers and a low percentage of African-Americans in these professions, the University attempted to involve more black students. In an attempt to do this, the Meyerhoff Scholars Program was created at UMBC in 1988 with a grant of $522,000 from the Robert and Jane Meyerhoff Foundation. Mr. Meyerhoff was interested particularly in addressing the shortage of blacks, especially black males, who undertake careers in the sciences and engineering. The initial grant enabled UMBC to launch a program of full support for outstanding African American students, competitively selected from across Maryland, who would major in mathematics, science, engineering, or computer science, and then pursue Ph.D.s in these areas. The first group of Meyerhoff Scholars included 19 young men, all Maryland residents, who enrolled in Fall 1989. Now in the sixth year, the Program has a total enrollment of 156, including 37 new Meyerhoff freshmen in Fall 1994 (with a combined average SAT score of 1280), 82 young women, and nine students from outside Maryland (from New York, California, Indiana, Alabama, and Pennsylvania). The National Science Foundation has indicated that UMBC has one of the largest concentrations of bright African American students majoring in science anywhere in the United States.

**Meyerhoff Initiative Successes**

Many indicators point to the success of the Meyerhoff Program and its students. To wit:

- Extraordinary retention rates among the Meyerhoff students (virtually 100%).
- Consistently high grade point averages (3.4 or higher for Meyerhoff freshmen and continuing students).
- Impressive internship and placement experiences in laboratories at such locations as AT&T Bell Laboratories, at the Johns Hopkins University School of Medicine's Biomedical Engineering Department, MIT's Chemical and Mechanical Engineering Departments, Harvard University Medical School's Summer Honors Undergraduate Research Program, the University of Colorado-Boulder's Department of Chemistry & Biochemistry (lab of a Nobel laureate), the National Institutes of Health, the National Institute of Standards & Technology's Computing & Applied Math lab, Silicon Graphics, IBM, the University of California-Berkeley's Summer Mathematics Institute, the University of Maryland School of Medicine, St. Thomas Hospital's Mass Spectrometry Facility Institute (London, England), and UMBC's Structural Biochemistry Center.
- The fact that several of the students, based on their research experiences, have produced publications (extraordinary for most undergraduates).
- Substantial outside support received by the Program from such public and private sources as NSF, NASA, National Security Agency, U.S. Department of Energy, IBM, AT&T, Chevron Corporation, Apple Computer, Lilly Foundation, Sloan Foundation, General Electric Foundation, W.R. Grace, Inc., Baltimore Gas & Electric Company, and Meridian Health Care.
- Post-graduate study by students in the Program's first two graduating classes (1993 and 1994), including e.g., Ph.D. programs at MIT (Physics), University of Pennsylvania (joint M.D./Ph.D. program), Princeton (History of Science), Northwestern (Electrical Engineering), University of Virginia (Environmental Science & Biophysics), University of Michigan-Ann Arbor (Electrical Engineering), University of Florida-Gainesville (Computer Science), University of Maryland-College Park, (Applied Mathematics), and M.D. programs at Duke, University of Virginia, Johns Hopkins University, University of Maryland at Baltimore.

**Interview**

BaCote and Dr. Freeman Hrabowski, President of UMBC - April 21, 1995

BaCote: To what do you attribute, generally, your outstanding record in the production of science and engineering baccalaureates who go on to doctoral study?

Hrabowski: The leadership group here at UMBC sets the tone for excellence for our students. Our motto for success is "to whom much is given, much is required."

BaCote: Specifically, do you make an effort to recruit outstanding black undergraduates to come to your school? If so, how so?

Hrabowski: Yes, we look at outstanding high school students with SAT scores of 1200, math score averages 600 to 675. We're now learning to help the second tier. Twenty students are now in Ph.D. programs and 21 students in Ph.D.-M.D. programs.

BaCote: Specifically, do you offer any other special scholarships and fellowships to outstanding black undergraduates who attend your school?

Hrabowski: Yes, 4 fellowship summer stipends are guaranteed in the Ph.D.-M.D. program at Johns Hopkins, MIT, Harvard, and Rice in June of 1995. Also, the Federal Express National Award to the student with the highest GPA in S&E in the country was awarded to a UMBC student.

BaCote: Do you make special efforts to provide mentors to outstanding black S&E undergraduates?

Hrabowski: Yes, black scientists throughout the Maryland and DC area serve as mentors for our students. Also we have on our staff a former graduate from the school of S&E who serves as a role model for students.

BaCote: Is there a special effort to encourage black undergraduate attendance at, and participation in, scholarly meetings and conferences? Do you involve black S&E undergraduates in research projects on your own campus? What about other laboratories and institutions?

Hrabowski: Yes. The students are required to attend professional S&E meetings throughout the United States. Enclosed is a published paper presented on HIV in the Journal of Molecular Biology by one of our own fellows. All students are encouraged to publish and present scientific papers at national conferences before graduating. They have also worked on summer projects at NIH and other university laboratories.

BaCote: How does UMBC involve black S&E undergraduates in preparatory experiences for completion of the GRE? Do you offer any assistance in

helping black students line up scholarships, fellowships and assistantships for graduate study?

Hrabowski: Yes. Our counseling department works with students from the moment we identify them as S&E potential majors. The McNair Program is coordinated through our counseling center which allows students to prep for the GRE and MCAT. We make sure that our S&E majors take courses that assist them in lining up scholarships.

BaCote: Do you use black alumni who are working on, or who have completed, S&E doctorates as role models and networkers in this effort?

Hrabowski: Yes, as a young institution we still strive to have mentors for our students by including former graduates, professors and black scientists in the DC, Maryland area.

BaCote: Specifically, do you receive any special funding to support efforts to increase black participation in S&E doctoral study?

Hrabowski: Yes, the highest of honor societies, The National Association of Black Engineers, NASA, Department of Energy and the NIH all contribute to the UMBC Meyerhoff Program.

BaCote: Do you have any special organizational structures on campus which may be helpful in sending so many black S&E graduates on to doctoral study, e.g., black Culture Center? black Honor Society?

Hrabowski: Yes. The National Association of Black Engineers which holds regular group meetings and discussions on excelling in S&E.

BaCote: Would you like to discuss any other aspects of your "formula for success"?

Hrabowski: I attribute my success to having a family atmosphere on this campus. I take approximately 150 students to church, dinners, and plays throughout the year. Keeping my motto ever present in the minds of faculty, students and alumni, "of those whom much is given, much is required". My vision for UMBC is "hold fast to dreams."

# *Site Visit: Cornell University*

## *Nketchi Agwu*

**Introduction**

Cornell University was founded in 1865. It is a private, non-profit, coeducational, non-sectarian, land grant institution of higher learning, chartered and operated under the Laws of the State of New York. It is also an Ivy league university.

Cornell University is committed to the recruitment and retention of minority students. It has been highly successful in the recruitment and retention of Hispanic students, particularly in the field of Engineering. The commitment of Cornell University to the recruitment and retention of minority students is highly visible in all avenues of academic life at Cornell, viz.: admissions, financial aid, advising, student academic support services, opportunities for research, professional development, employment and graduate study.

**Recruitment and Admissions**

Admissions staff maintain close network links with high minority population schools. Most of the identified schools are in the urban areas of New York, Pennsylvania, and the South.

Admissions staff utilize the services of Cornell faculty and alumni, school administrators, teachers, and counselors, and agencies such as the Parents Teachers Association to identify possible minority recruits. The Ivy league status of Cornell also draws a significant number of academically strong minority applicants from diverse academic cultures.

The college of Engineering has a long-standing professional link with Radio Telescope in Aricebo, Puerto Rico and with the University of Puerto Rico. Visiting faculty from Cornell at Radio Telescope and the University of Puerto Rico assist in identifying possible recruits from Puerto Rico. Most of Puerto Rican recruits are from the upper class in their society, which impacts the retention rate of Hispanic engineering students. Also, within the college of Engineering, the program mix of

applied, contract, and traditional engineering, which is rarely found in other universities, draws a significant number of applicants (minorities and non-minorities).

Admissions staff visit schools identified as having high minority populations to provide possible recruits, their guardians, teachers, counselors, and administrators with information pertaining to studying at Cornell. Possible recruits are invited to Cornell during "Hosting Weekend", at no cost to them, to explore possibilities of studying at Cornell. Guardians are also invited to Cornell during this weekend to accompany their wards. Cornell students and faculty are actively involved in the planning and implementation of Hosting Weekend. Students host possible recruits to provide them with "shadow experiences". A shadow experience occurs when the hosting student allows the possible recruit to participate as an active observer during the visiting period in all aspects of their academic life, such as following the host student to classes, the library, the computer cluster, and so on. Faculty interact with possible recruits and give them individual advising pertaining to studying at Cornell.

During the summer semesters, the university operates a "Pre-freshmen Summer Program" for recruits, at no cost to the recruits. The curriculum is heavy in developmental courses pertinent to their major. Funds from the Learning Skills Center (LSC) are utilized to offset student expenses for this program.

**Financial Aid**

Cornell University operates a need-blind admissions policy. That is, the university meets the full academic financial needs of admitted students, through loans, work study, and grants.

The college of Engineering has many special merit-based scholarships for undergraduate study, and other scholarships to encourage undergraduate research and graduate study. Below is a list of these scholarships and information pertinent to them:

- **National Action Council for Minority Engineering Scholarships** (supporting 9 students for 94/95 academic year - 4 sophomores, 2 juniors, 3 seniors). Varying amount per year for each

student - maximum $2,000, minimum $5000.

- **General Electric (GE) Fund Minority Scholarship Program**. Eligibility: minority students with a 3.5 or above cumulative G.P.A. (supporting 2 students for 94/95 academic year). Amount is $5,000.00 per year for each student.
- **General Motors**. Eligibility: minority student in the field of Industrial Engineering with 3.5 or above cumulative G.P.A.(supporting 1 student for 94/95 academic year).
- **GEM Fellowships**. Covers full tuition and fees $17,500 per year and a stipend of $6,000 per year (supporting 1 student for 94/95 academic year).
- **General Electric (GE) fund for faculty for the future**. Loan given to women and minorities between the ages of 24-30 years to support graduate study. Maximum allowable sum is $75,000.00, forgivable if the recipient pursues an academic career, repayable otherwise.
- **Summer Program** (supports approximately 12 students each summer). Provides summer support for undergraduate minority students, with potential academia interest, who are engaged in summer undergraduate research or internships. Also, provides summer support for minority graduate students through teaching or research assistantships.
- **Teresa Lazaro Memorial Master of Engineering Fellowship** (supports 1 student for 94/95 year). Eligibility: Puerto Rican student in the master of engineering program. Preference given to students in Civil and Environmental Engineering. Maximum amount $3,500 per year.
- **Department of Material Science National Science Foundation (NSF) grant** (supports 1 Ph.D. student for 94/95 year)

The department of Plant Science has a merit and need based financial aid package, viz.: **Ethyl S. Willits Cornell Tradition Fellowship**. Eligibility: Plant Science Student with financial aid application on file, loan component in financial aid package, commitment to work, community service, and academic achievement. Maximum amount $2,500

**Advising**

All students are advised by their advisors on the following issues: required and optional courses for their major, student support services and other strategies for academic growth, financial aid, professional development, employment, and graduate studies. Also, close academic track is kept on all students, especially freshmen, sophomores, and students on probation or "at risk" of probation. The university has an "Early Warning Program" in which mid-semester grades are reported by instructors for freshmen, sophomores, and students making a D grade or less. Notices are sent to these students about their academic progress. Students making a D grade or less in any course are advised to seek consultation with their academic advisor to discuss strategies to enhance their academic performance. Free tutoring is provided for these students if needed, and feedback on their progress is solicited from their tutors.

In the fields of Agriculture and Life Science, minority students are also assigned faculty and student advisors to provide them with mentoring and psychological support. The Engineering Minority Program Office (EMPO) within the College of Engineering, also utilizes this strategy with its students. Student advisors are usually graduate students or undergraduate students in a higher year with a G.P.A. of 3.0 or higher, majoring in the field of study. Student advisors are required to report on their mentoring activities to the faculty and/or staff advisors of the students they mentor.

**Student Academic Support Services**

The university operates a Learning Skills Center (LSC). This center is staffed in all the different subject areas. A substantial part of its clientele are minority students.

The Physical and Biological Sciences also operates a Mathematics Support Center (MSC). This center is staffed with mathematics tutors to provides support for students in all areas of mathematics, since mathematics is heavy in the Physical and Biological Science curriculum.

**Special initiatives to encourage undergraduate research, professional development, employment, mentoring, and graduate study**

Cornell University has several special initiatives to encourage undergraduate research, professional development, employment, and graduate study for minorities. Below is a list and description of many of these initiatives.

**Committee on Special Education Projects (COSEPT):** COSEPT organizes workshops to educate all students on taking lecture notes, text reading, and time management. It also provides support for projects pertaining to minority admissions and retention.

**Higher Education Opportunity Program (HEOP):** This is a program funded by the federal government. Students recruited through this program are assigned special advisors to provide them with mentoring, counseling, and psychological support. The program also provides Graduate Record Examination (GRE) preparatory classes for its students.

**Collegiate Science and Technology Program (CSTEP):** This is a program funded by New York State. It provides services to encourage students to pursue science and engineering majors. It provides academic support services for its students. It also provides its students with GRE preparatory classes and advising on graduate study.

**Office of Minority Affairs (OMA):** This office provides mentoring, counseling, and psychological support for all minority students at Cornell University. It also provides work study opportunities for minority freshmen and sophomores to get involved in research through the provision of matching funds for research opportunities provided by faculty for these students.

**University Career Center (UCC):** This office provides the following career related services for all students: resume and cover letter writing and review, interviews, and information on interviewing strategies, internships, and job opportunities. It also provides GRE advising and information on opportunities for graduate study.

**Hispanic-American Studies Program (HASP):** The majority of the faculty in this program are Hispanics from a variety of disciplines. They provide mentoring for undergraduate Hispanic students and encouragement for these students to pursue graduate studies.

**Undergraduate Research Program:** This is professional development program operated by the university. This program introduces undergraduates to research, provides faculty mentoring for undergraduates, and encourages faculty to provide research opportunities for undergraduate minority students, and undergraduate minority students to do research, through special funding for minority undergraduate research. It comprises the National Science Foundation (NSF) program for undergraduate research in science and engineering, the University Mellon program, and the Graduate School Minority Exchange Program. Cornell university is a member of the coalition under the NSF program for undergraduate research in science and engineering.

The NSF portion of this program provides research opportunities for undergraduate minorities in science related fields. It draws minority undergraduates from Hampton, Tuskegee, and Southern University to Cornell to participate in this program.

**Presidential Scholars:** These are a select group of students recognized by the university for high academic standing (3.0 G.P.A. and above) and other qualities. They are honored with a reception and the framing of their picture on the wall of presidential scholars.

**Special Initiatives: College of Engineering**

The following is a list and description of special initiatives that exist within the college of Engineering:

**Merrill Scholars:** This is a special program funded under the support of Merrill to recognize outstanding graduating scholars. The program actively involves significant mentors of the scholar, viz.: best college and high school instructors, by funding their visit to attend the ceremony. This helps to promote the public image of Cornell, which is significant for recruitment. The Merrill scholars program has been very successful in producing Presidential Scholars.

**Engineering Minority Program Office (EMPO):** This program exists within the College of Engineering, and is modeled after the HEOP strategies of emphasis on partnership with the students. There are 125 self-identified Hispanic students within EMPO. Eighty-nine of these

students have a 3.0 G.P.A. or higher. Below is a breakdown based on G.P.A., number of students, and stage in the program.

| G.P.A. | # of students | Sen. | Jun. | Soph. | Fresh. |
|---|---|---|---|---|---|
| 4.0 | 4 | 1 | 0 | 0 | 3 |
| 3.5 - 4.0 | 6 | 4 | 1 | 0 | 1 |
| 3.0 - 3.5 | 29 | 7 | 9 | 8 | 6 |
| 2.5 - 3.0 | 50 | 13 | 13 | 13 | 11 |
| 2.0 - 2.5 | 30 | 8 | 7 | 11 | 14 |
| 1.5 - 2.0 | 6 | 0 | 0 | 2 | 4 |

EMPO provides the following academic and career related services for its students:

•A study lounge and conference rooms equipped with copying services, computing devices, texts, exams, files, cultural artifacts, and other learning aids.
•Seminars to provide students with information about university resources, and information related to graduate study and services related to preparatory experiences for completion of the GRE.
•Bulletin boards for academic and career related information.
•Solicitation of grants to support minority admissions and retention. One administrative staff has been hired solely for this purpose.
•Grants for travel to scholarly meetings and conferences. Students are required to write a report of the meeting/conference on their return.
•Peer, faculty, and staff mentoring for students, as well as counseling and psychological support. A peer counselor (majoring in the field of study), who is either a graduate student or an undergraduate student at a higher academic level with a 3.0 G.P.A. or higher, is assigned to each student. The peer counselor reports directly to the appropriate EMPO counselor on issues related to their peer mentoring. EMPO sponsors faculty student luncheons, provides work study opportunities for students, and EMPO staff attend the Society of Hispanic Engineers (SHIPPEE) meetings as part of the effort to provide mentoring, counseling, and psychological support for students.
Career advising, viz.: resume and cover letter writing and review, interviewing strategies, weekly newsletter listing internship and job opportunities. An experienced counselor and former architecture professor at the University of Puerto Rico has been hired for this purpose.

The Industrial Advisory Council (IAC), comprised of alumni and a few other people in the engineering profession, serve as steering committee for EMPO. They assist EMPO in solicitation for grants for leadership development and academic scholarship.

**Engineering Seminar 150:** This is an optional one credit course to encourage student contact with

faculty in a informal manner. It is also geared towards helping faculty teaching freshmen to revise their teaching methods to be more student-centered and inclusive through cooperative learning, cultural sensitivity, and so on.

**Special Initiatives: College of Arts and Science**

The following is a list and description of special initiatives that exist within the college of Arts and Science:

**Dean's Office:** The dean's office provides modest support to students to attend scholarly meetings and conferences.

**Hispanic Minority Science Program (HMSP):** This program provides modest support for Hispanic students to attend scholarly meetings and conferences.

**Graduate Studies Office:** The college of Arts and Science maintains an office to keep track of graduate study opportunities for all students and advise students on graduate studies.

**Research Fairs:** The college of Arts and Science organizes student/community research project fairs. These fairs encourage undergraduate research projects and undergraduate networking with the immediate research community, through exhibition of undergraduate research projects and community research components.

**Bio-Sci News:** This is a weekly newsletter, produced by students in the Biological Sciences, for students in Biological Sciences. It provides information on: the calendar of important dates, career and graduate study opportunities, biological science faculty, biological science courses, student advising, financial aid, graduation information, summer research opportunities, and internships.

**Special Initiatives: College of Agriculture and Life Sciences**

The college of Agriculture and Life Sciences organizes career related seminars on a regular basis. Alumni are actively involved in the planning and implementation of such seminars, in particular, serving as speakers.

**Student Organization Initiatives**

The following is a list and description of student organization initiatives:

**Cornell Latino-American Association (CLAA), Cornell Black-American Association (CBAA), Cornell Asian-American Association (CAAA), and Cornell Native-American Association (CNAA)):** These Agricultural and Life Sciences student organizations adopt schools in the area to disseminate information pertaining to studying at Cornell or pursuing a major in Agriculture or Life Science. They offer possible recruits shadow experiences. Possible recruits are opportuned to spend one day to one week accompanying their host through academic and social engagements on campus, such as classes, use of the library, and so on.

**Black BioMedical and Technical Association:** This Biological Science student association organizes an annual conference on issues related to science, health, and medicine. Alumni and guardians of students who are in science or medical professions are actively involved in planning and implementation of the conference, and assisting organization in networking with professional organizations or its counterparts in other schools. Many alumni and guardians of students who are in science or medical professions serve as speakers for this conference.

**Cornell branches of the following national Agricultural and Life Sciences organizations (Minority Agricultural and Natural Resources Related Science Organization (MANRRS), Minority Undergraduate Veterinary Association (MUVA)):** These organizations provide funds to minority students (to supplement funding from their college) to present at scholarly meetings and conferences. They also provide assistance to minority students to publish scholarly work.

**Cornell branches of the following national Engineering organizations (Society of Hispanic Engineers (SHIPPEE) and National Society of Black Engineers (NSBE)):** These organizations provides the following academic and career related services to Hispanic and African-American undergraduates:

- Information about scholarly meetings and conferences, and grants for national conferences on the basis of service, leadership roles, and academic performance.
- Information related to academics, viz.: scholarships, tutoring, and graduate study. Also, provides peer mentoring and tutoring services.
- Faculty mentoring in terms of academics, graduate study, internships, and jobs, in particular from Hispanic faculty. The 94/95 SHIPPEE advisor is Prof. Roderiguez. He is a Hispanic faculty member of the College of Engineering, a member of the IAC, and a member of the HASP advisory board. He is very active in his advisory role and has significantly impacted the planning and implementation of many SHIPPEE activities, through his membership in IAC and HASP advisory board.
- Employment related services, viz.: resume and cover letter writing and review, interviewing strategies, information on internship and job opportunities.

**Summary**

Evidence from Cornell University's production of Hispanic doctoral starts suggest that the production of high minority doctoral starts in any university requires a strong commitment by the university to the recruitment and retention of minority students. In particular, the university should be sensitive to the needs of these students in its programs on admissions, financial aid, advising, and student academic support services. Special federal, state, and university funds should be set aside for programs that encourage minority undergraduate research, professional development, employment, mentoring, and graduate study. The university should be committed to structuring these programs to be highly successful in achieving their goals. Minority student organizations should also be highly encouraged and adequately funded to support the academic needs of minority students. Lastly, there needs to be active involvement of university faculty, administration, students, and alumni, school teachers, administrators, and counselors, guardians, and national agencies and organizations, and the community, in the process of minority student recruitment and admissions.

# *Site Visit Report: University of California at Los Angeles*

## *Anita L. Fields*

The University of California at Los Angeles (UCLA) ranked fourth as a college of baccalaureate origin for Hispanic science and engineering doctorate recipients for the period under study: 1988-93. The School of Engineering and Applied Science, an outgrowth of the College of Engineering founded in 1945, is recognized for producing innovative graduates who demonstrate a mastery of scientific knowledge. UCLA's students, particularly those associated with the Center for Underrepresented Engineering Students (CUES), are valued for their balanced approach which integrates classroom investigation with market applications. This recognition is underscored by the mutual collaboration between faculty and industry in every facet of the program.

CUES has three programs - SMARTS, MEP and OMEGA - which create a pipeline for students which begins in secondary schools and extends through the undergraduate and graduate courses of study. These programs focus on the recruitment and retention of engineering students and are financed jointly through the corporate community, the university and government programs. The pipeline begins with the identification, tutoring and recruitment of potential math, science and engineering majors in the SMARTS program. The SMARTS program targets 8th, 9th and 10th grade students, concentrating on schools with a minority population, who have demonstrated an interest in and the aptitude for science and math. Participants receive instruction in math, science and laboratory techniques in a six week course during the summer and a seven week course during the spring and fall. During the 10th grade, SMARTS participants are placed in laboratories at UCLA with undergraduates. A portion of the SMARTS students enter UCLA, some go on to other colleges and universities.

During the college admission process, the Minority Engineering Program (MEP) works with **industry leaders** in recruiting minority students. Students are contacted by **industry members** and

the benefits of UCLA's program and its reputation are discussed. After admission to UCLA, and prior to the beginning of the school year, students attend a two week Prep-Bridge course or boot camp. During Prep-Bridge, students become acclimated to the pace of engineering school and their skills and work habits are audited as they receive advance preparation for classes in math, chemistry and computer science. Learning to work as a team, in which information, resources and skills are shared, is an important skill in engineering and one that must be developed in many minority engineering freshman. Unlike members of other cultural groups, i.e. Asian-Americans, many minority high school students who excelled in math and science learned to work alone and they easily outperformed their peers. The collaborative learning techniques and community building activities introduced in Prep-Bridge facilitates their transition to a college campus with students from diverse backgrounds and begins to create an academic support group in which knowledge is shared.

The Prep-Bridge is followed by a Freshman Orientation course - Engineering 97, Engineering Disciplines - which further exposes students to the engineering profession and reinforces effective study skills. MEP students are clustered into classes with outstanding teachers. These clusters are simultaneously supported by graduate students in Academic Excellence Workshops. During the workshops, students receive exercises which support classroom materials along with advance exercises which are more challenging. During the workshops, students engage in the collaborative problem solving techniques of the professional workshop: functioning as a team, pooling resources and exchanging information. The workshop becomes a project group and reinforces the community building and collaborative learning strategies of MEP students during their freshman year. These strategies are expanded during their sophomore year. Collaborative learning is seen as an indispensable tool in promoting academic excellence in minority engineering students. Former UCLA **alumni** and **industry leaders** tutor MEP participants and discuss career demands. Students are told during this time of the benefits of obtaining a post-graduate degree: more job security,

prestige and the options that come with additional training. The MEP effort is focused on freshmen. Student organizations, professional societies and peer groups (built during their first two years) gradually become the primary support group during their academic careers and as professionals.

Approximately 12% of UCLA minority graduates enter graduate school. UCLA's Academic Advancement Program encourages students to attend graduate school and faculty members assist in cultivating their interest in post-graduate education. Finances are a critical factor in this decision for many minority students. The Graduate Engineering Minority group and the Opportunity for Minority Engineers for Graduate Achievement ("OMEGA") become involved with students during their third year of study and assist minority students in preparing for the GRE and in obtaining assistantships and fellowships.

Key factors in producing successful minority S&E students at UCLA:

- **Extensive Support of the Corporate Community**: industry leaders such as IBM, TRW, Rockwell, Hughes, Intel, Microsoft, GTE work closely with the School of Engineering and with minority students. They provide:
  - Sources of financial assistance for the programs that recruit and retain minority students.
  - Students with research opportunities and jobs which helps professionalize the students and encourage them to remain in the program.
  - Students with role models, mentors and tutors.
- **Use of Cultural, Academic and Professional Support Groups**: The Society of Latino Engineers and Scientists; National Society of Black Engineers; National Action Council for Minority Engineering; OMEGA; and GRE provide the academic and psychosocial support, which begins with MEP, for minority engineering students and professionals. These groups:
  - Involve students in scholarly meetings and conferences.
  - Provide a source of mentors and financial assistance.
- **Tracking or Monitoring of Students:** additional tutoring and/or counseling is provided for

average students or students close to a 3.0 GPA.

The collaboration between UCLA's School of Engineering, CUES and their corporate benefactors has benefited all involved. MEP, which assists students by building a strong academic and psychosocial foundation or support group, provides students with the tools needed to continue to build on their academic success in graduate school and as professionals. The effectiveness of MEP is reflected in the GPA of its participants compared to the non-MEP students: MEP students outperformed all other UCLA students by approximately .79 grade points. Government or business financed research utilizes this scientific knowledge in internships or summer jobs, while professionalizing minority students and exposing them to real world applications. The corporate community benefits in the market from the innovations of UCLA alumni and the program is seen as a rich source of talented employees. The reputation of the program in the corporate community encourages their involvement in financing recruitment, research and training.

# *Site Visit: Arizona State University*

## *William F. Brazziel*

Arizona State University is located in Tempe, Arizona, a city of 140,000 located in the fast-growing Phoenix metropolitan area. Its enrollment of 42,000 makes it the fifth largest university in America. It is a regional state university success story of the first order. It began as the Arizona Territorial Normal School and followed the usual progression of such schools to university status: Arizona Normal School, Arizona Teachers College, Arizona State College, Arizona State University. It received the ultimate ranking of Research I University in the 1994 listings of the Carnegie Council on Higher Education. It is a prime example of one of the younger universities on the scene with a faculty and administration eager to make their mark in teaching, research and service. This fact was recognized by the U.S. News and World Higher Education Report of 1989 which named ASU one of the six "up and coming" universities in the nation.

ASU is strong in astronomy, computer science and nuclear physics, Like many regional state universities, it enrolls large numbers of older and returning students. Consider that it is located in one of America's premier retirement communities.

ASU was not in the top ten universities listed as colleges of baccalaureate origin for Hispanic S&E doctorate recipients. It was ranked in the top 40, however, and with the energy it expends on its efforts, it will surely find a place in the top ten rankings in the very near future. Consider that it is a very young Research I university.

ASU features recruitment of blue ribbon Hispanic students as the center piece of its minority initiative, according to Dr. Antonio Garcia, an associate in ASU's Hispanic Research Center. The struggle, according to Dr. Garcia, is to keep their talent home. Maricopa County, home of ASU, is huge, has excellent schools and is turning out some top-flight Hispanic graduates. Hispanics comprise 20 percent of Maricpoa's population and 35 percent of its school enrollment. When ASU

recruiters go to the schools, however, they find recruiters from all over the nation hawking their wares, so to speak. Although most of ASU's students commute to the campus, housing and a dorm atmosphere is available to 15,000 students and S&E recruiters can assure freshmen the same campus atmosphere they would get if they went elsewhere.

ASU is the home of Project 1000, a group based in the Graduate College, which encourages Hispanic applications to graduate school. The group is headed by Michael Sullivan and has a national scope. Hispanic graduate students across the nation forward their credentials to the Center where they are screened and those which pass muster win their holders the cost of applications fees to as many as eight graduate schools and a letter of recommendation for their admissions folders. Project 1000 is widely advertised - and widely used.

ASU is also the home of HYPERAMP, an Internet resource which lists all known scholarship and fellowship sources for Hispanic students, both undergraduate and graduate. Indeed, some of the ASU undergraduates aspiring to S&E graduate degrees have worked on HYPERAMP and are quite familiar with the opportunities it affords. The acronym has to do with the giant AMP program described earlier (Alliances for Minority Participation). HPER is an allusion to the cyberspace applications employed in handling this information. Both AMP and HYPERAMP are funded by NSF.

Like other schools, ASU places its blue ribbon minority students with mentors who begin early on to head them toward graduate study. They are afforded undergraduate research opportunities and are afforded funds for travel to conferences - if they are presenting a paper or appearing on the program, or assisting with the management of the conference.

Like other schools, ASU supports student chapters of minority serving professional organizations, e.g. NACME (National Action Council for Minority Engineers), SHPE (Society of Hispanic Professional Engineers) and AISES (American Indian Science and Engineering Society).

Like a growing number of institutions, ASU is a prime mover in the Valley of the Sun AMP, the NSF-sponsored alliance to rally parents, school people, churches, corporations and others to the

cause of involving more Hispanic students in science and engineering.

A summary of the ASU minority S&E initiative follows:

- Heavy emphasis on the recruitment of blue ribbon Hispanic students. Very heavy emphasis on attracting home-grown talent from Maricopa County, AZ which has one of the better school systems in the nation.
- Early mentoring with an emphasis of heading blue ribbon Hispanic students to S&E graduate study early on.
- Support of student chapters of minority serving professional S&E associations, e.g., NACME, SHPE, AISES.
- Support for undergraduate research, both on campus and off-campus, e.g., Sandia Labs, NASA.
- Support of student conference attendance, especially for poster sessions, paper presentation and for assistance with conference management.
- Use of Project 1000 to spur search for admission and assistantships.
- Wide use of Hispanic role models.
- Excellent follow-up of alumni who have gone on to graduate school and completed the doctorate.

# *Part III*

# *Summary Observations*

# *Summary Observations*

Again, this study examined the many efforts of the government, colleges and universities, foundations and private philanthropists to increase the participation of three minority groups in the study of science and engineering. These groups are American Indians, Hispanic Americans and black Americans. These groups comprise 20 percent of the population but only ten percent of baccalaureate and five percent of doctoral S&E recipients. In the coming years they will comprise upward of 40 percent of the workforce (Hudson Institute, 1987).

The study also examined the distinctives of colleges and universities which send large numbers of their minority graduate on to doctoral study in science and engineering. These institutions are referred to as baccalaureate colleges of origin. They are vitally important in efforts to increase the presence of minority baccalaureates in the S&E "pipeline." And, as will be seen, they are doing yeoman's service in the vital effort to socialize children and youth into S&E careers. They are doing this through an interesting collection of community and school-based programs.

**Initiatives to Increase Minority Participation.**

**Acronyms** are plentiful in the large number of programs developed to increase minority participation in science and engineering. MARC and AMP are not nicknames for kids, they are acronyms for NIH and NSF programs respectively (Minority Access to Research Careers and Alliances for Minority Participation) which effectively involve more and more young minorities in science and engineering study. AMPS is perhaps the most effective in rallying all interested parties, e.g., children, parents, churches, schools, corporations, in the effort to increase participation. MESA (Mathematics, Engineering and Science Achievement) is perhaps the most effective in rallying schools themselves.

**Urban colleges and universities** seem particularly effective in mounting programs. This is especially true of public universities which have been designated the urban university for their

states. Morgan State University of Baltimore is a case in point. The institution has some 40 programs which work with schools and communities and their children to increase involvement of minority children in S&E. Science and engineering camps overflow the campus each summer. Camps are perhaps the most effective method of involving children. Morgan has them for kids as young as eight years of age. Other outstanding urban universities are City University of New York and Jackson State University of Mississippi.

**The Dana Center** at the University of Texas and the **Jaimie Escalante Center** at East Los Angeles College lead the nation in the search for improved methods of teaching S&E to minorities. Both stress excellence in mathematics. Many colleges and universities are pioneering with the New Calculus and most of the universities involved in the AMP program are using the approach. The New Calculus addresses each topic three ways: numerically, geometrically and algebraically. Practical problems are employed in the instruction and active, collaborative learning is the order of the day. Calculus is the mathematics of motion and as such is vitally important to the skills repertoire of scientists and engineers. It is quite discouraging to most students, however, and over the years has comprised the most formidable obstacle to successful study in S&E. Success in the new approaches will help many minority students although the effort is not directed toward minorities specifically.

**Spinoffs from Dr. Treisman's research are rippling across the country.** The programs are labeled Emerging Scholars Programs and involve undergraduates as well as K-12 minorities -and poor white people. It is this grassroots fervor that will eventually get rid of underrepresentation of certain groups in S&E. Veena Kaul of the Dana Center along with Florence Fassenelli of the Mathematics Association of America comprise a veritable fount of knowledge about these programs.

**Undocumented Truths regarding minority science and engineering teaching and learning** are present in many of the action efforts and should be looked at more closely. Action oriented

program directors drive for success and rarely seek to discern the secrets of their success. Dissertations and other types of studies can make a contribution here in the documentation of factors leading to success. The dissertation work of Marco Kinsella is a case in point. Kinsella teaches mathematics in a highly successful Connecticut Upward Bound-type program which is sponsored by the Connecticut Board of Higher Education. Half of the students in this program selected S&E majors and all compiled impressive GPAs. Kinsella's regression exercises revealed that the most important factors in this success were study habits and attitudes toward college, teachers and life in general. The leading correlate was birth order. The most successful students were first born or only children (Kinsella, 1994).

**The number of fellowships and scholarships for graduate study is growing, it seems.** This may be the most important aspect of efforts to produce more minority S&E doctorates. Significantly, paucity of fellowships and scholarships was mentioned many times in interviews with officials at high producing schools. These people noted that some of their best students decided to go into other fields such as medicine or law, or go to work for a corporation, because they could not line up assistance. Two things must be kept in mind here: 1) most minority students have limited resources and paying for doctoral study is virtually out of the question, 2) minorities are less apt to be offered teaching or research assistantships. So, fellowships and assistantships must be plentiful if the effort is to succeed. One bright spot on the horizon is the decision of the LSU chemistry department to bring in 20 black students and award teaching and research assistantships to them. This is a breakthrough of enormous proportions. Hopefully, it will be repeated everywhere. It would solve a huge problem.

**Research is needed on minority decisions to pursue science and engineering doctoral study**. As noted above, professors and program directors report that some of their better undergraduates are opting for medicine, dentistry or law. Some go to work for corporations and others simply are not able to line up scholarships and grants. The picture here is murky as almost

all studies on doctoral students are ex post facto. Looking deeply into the decision process will be a difficult task but it must be undertaken if the broad initiative is to succeed.

**Initiatives to Recruit and Train Minority S&E Doctoral Starts.**

Colleges and universities which do a good job recruiting and training minority science and engineering undergraduates who go on to become doctoral starts have a number of distinctive characteristics.

**Many are minority serving institutions.** This distinctive is powerful. Faculty and administration are totally motivated to succeed in the mission of advancing the fortunes of their students and their institution by sending as many science and engineering students as possible to doctoral study. The service area is full of minority candidates, many very bright, ready to be molded. Alumni are ready and willing to be helpful in the effort. Role models are plentiful, both on the faculty and in the community. Howard University, New Mexico Highlands University and Northeast Oklahoma State University are all cases in point. They are minority serving institutions for primarily black, Hispanic and Indian communities respectively. All are listed among the top ten colleges of baccalaureate origin for their groups.

**Many have close relationships and contacts in minority communities**. Cornell University is a case in point. Cornell ranks high here. Large numbers of Cornell Hispanic students come from Puerto Rico itself. The contact here comes from Cornell professors and administrators who are deeply involved in research and engineering related to Radio Telescope, the giant facility located in the hills around Aricebo, Puerto Rico. Frequent trips and extended stays of Cornell faculty at the facility enable them to identify outstanding students and send them to Cornell. After an initial period of trust establishment, students and their parents now search out the Cornell people to arrange for study on the mainland.

**Many use sophisticated recruitment programs and close contacts with excellent preparatory schools bring in good students.** Harvard is a case in point here. So is Stanford and

MIT, all found among the Top Ten producers of doctoral starts for all minority groups in the study. Reputation and prestige play a large role here, of course, but the schools are perhaps the largest users of the College Board Search Service. Suffice it to say that each year these schools have a total grasp of the location of the top minority S&E talent in the country. From that point on an offer of enrollment and some financial aid will get the talent on the campus.

**Some use alumni who are not S&E grads but who have close contact with good students.** Witness the 150 black graduates of Gustavus-Adolphus over the last 30 years, many of whom have gone on to doctorates. Almost all have been from Corinth, Mississippi. G-A officials have routinely offered scholarships to the top black high school seniors in Corinth over the years. The practice was begun through contacts with the first black G-A graduates, some of whom became guidance counselors in Corinth public schools. A direct pipeline.

**A few use outstanding scholarship offers to attract minority talent.** The University of Maryland - Baltimore County is a case in point. In a few years, Norfolk State University will join the list. Both administer programs underwritten by private benefactors which afford full scholarships to minority students through the undergraduate years to the S&E doctorate. Would that such programs could be cloned elsewhere on a grand scale.

**Almost all use minority professional associations to good advantage.** Student chapters of AISES (American Indian Science and Engineering Society) along with chapters of NACME (National Action Council of Minority Engineers) and SHIPEE (Society of Hispanic Engineers) do yeoman's service in socializing undergraduates into the profession. They learn what is expected in the way of class work and they learn what the rewards system has to offer in their chosen fields. These organizations are growing and comprise a fine way for the elders in the professions to bring along their replacements.

**Almost all use mentoring to good advantage.** The motto: "students don't get lost at Howard," pretty much sums up the value of mentoring in the process of talent development at high producer

institutions. Students are literally taken by the hand on their appearance on the campus and introduced to the mysteries of the guild by the mentoring programs on high producer campuses. S&E with its loads of hands-on and laboratory work is a natural for mentoring, it seems, and high producer schools use it well.

**Almost all are good at helping students line up fellowships and scholarships for doctoral study.** When all is said and done, this may be one of the most important aspects of the initiatives of high producers of minority science and engineering doctoral starts. All is for naught unless we can get the students into situations where life can be sustained until the doctorate is completed. It must be remembered here that most of the students here have modest means and that some have no means.

**Faculty and Administrators are "True Believers."** Perhaps the most unusual, and surely the most inspiring, aspect of these operations was the level of commitment of faculty and administrators. These people believe in the vital importance of what they are doing and they invest an inordinate amount of time and energy in their initiative. In summary, one could note that S&E doctoral starts and doctoral recipients are unusual individuals and that the people who produced them, their professors and administrators, are unusual as well.

**NSF and companion initiatives should work.** Some remarkable efforts at talent conservation and talent development are underway at all levels, and by many entities, e.g., NSF, DOE, foundations, corporations, private benefactors, colleges and universities. Already we can see modest results. In only three years, minority science and engineering enrollment and baccalaureate production increased in states affected by AMP operations. In a 1994 national study by NSF, both minority undergraduate and graduate enrollment in S&E was up significantly. So were graduation rates. This is encouraging. One hopes that the momentum will be maintained. We are convinced that a broad study of minority participation in science-based jobs will show an increase in a few years. This is all to the good. Most of the better-paying jobs will be science-based in the years to

come. Perhaps the most significant development was the new policy of the Baltimore public schools to require algebra - the gatekeeper to the study of science - of all eighth graders. Hopefully, other cities with large minority populations will follow suit.

We are also convinced that production of master's and doctorate degrees - the focus of this study - will increase in the years ahead. The key to the realization of all of these good things is to do everything possible to maintain the momentum of the effort - really the movement. Hopefully, we will be able to do this. The following set of tables indicates that whatever is going on is producing results. Ranging from first-year enrollment in science and engineering to baccalaureate recipients, to graduate enrollment, to master's recipients, to doctoral recipients, the tables show solid gains over the time frames employed. There is reason for hope.

Table 1

Minority First-Year Science and Engineering Enrollment: 1986-1991

| Group | 1986 | 1991 |
|---|---|---|
| Black | 81,305 | 98,248 |
| Hispanic | 30,808 | 38,922 |
| Indian | 2,823 | 3,574 |

Source of Data: Women, Minorities and Persons with Disabilities in Science and Engineering. National Science Foundation. 1994.

Table 2

Minority Science and Engineering Baccalaureate Recipients: 1985-1991

| Group | 1985 | 1991 |
|---|---|---|
| Black | 20,223 | 23,170 |
| Hispanic | 13,373 | 17,021 |
| Indian | 1,603 | 1,594 |

Source of Data: Women, Minorities and Persons with Disabilities in Science and Engineering. National Science Foundation. 1994.

Table 3

Minority Science and Engineering Graduate Students: 1985-1992

| Group | 1985 | 1992 |
|---|---|---|
| Black | 10,552 | 15,370 |
| Hispanic | 8,821 | 12,243 |
| Indian | 745 | 1,253 |

Source of Data: Minorities, Women and Persons with Disabilities in Science and Engineering. National Science Foundation. 1995.

Table 4

Minority Science and Engineering Master's Recipients: 1985-1992

| Group | 1985 | 1991 |
|---|---|---|
| Black | 3,152 | 3,805 |
| Hispanic | 1,885 | 2,575 |
| Indian | 213 | 294 |

Source of Data: Minorities, Women and Persons with Disabilities in Science and Engineering. National Science Foundation. 1994.

Table 5

Minority Science and Engineering Doctorate Recipients: 1986-1991

| Group | 1986 | 1991 |
|---|---|---|
| Black | 949 | 1,156 |
| Hispanic | 709 | 867 |
| Indian | 99 | 132 |

Source of Data: Minorities, Women and Persons with Disabilities in Science and Engineering. National Science Foundation. 1994.

# *Part IV*

# *Initiatives Checklist*

## *Developing Minority Science and Engineering Doctoral Starts*

# *Initiatives Checklist*

***Developing Minority Science and Engineering Doctoral Starts***

***In the Introduction section of this report, we alluded to a checklist which was developed by the American Council on Education for their report on exemplars in the production of minority S&E doctorates. We noted that we would create a similar checklist for institutions wishing to mount initiatives designed to increase the numbers of minority graduates who go on to become S&E doctoral starts.***

***We believe that such a checklist need only consist of a dozen or so items for institutions wishing to mount such an initiative or effect improvements in their present initiatives. Faculty, administrators and trustee board members of such an institution might simply ask themselves the questions on the checklist on the pages which follow and address those items on which they fall short.***

***We also strongly recommend that these institutions take steps to become associated with the AMP (Alliances for Minority Participation) in their area or in another area. The University of Washington is a case in point regarding the latter. Failing to find an AMP in the Seattle area, it joined NCAMP (North Carolina Alliance for Minority Participation), a nationwide alliance led by North Carolina A&T University, a historically black university with a top notch engineering school.***

# *Initiatives Checklist*

## *Developing Minority Science and Engineering Doctoral Starts*

| *Initiative* | *Yes* | *No* |
|---|---|---|
| *1. Is the president, his/her cabinet and the trustee board totally committed to increasing minority S&E doctoral starts?* | | |
| *2. Are key faculty members on our campus totally committed to increasing minority S&E doctoral starts?* | | |
| *3. Have we mounted an outreach program to identify and begin to work with children and youth who may later enter our baccalaureate S&E programs?* | | |
| *4. Are we aggressively recruiting blue ribbon S&E minority students from the service area of our institution? From other service areas in our state? In other states?* | | |
| *5. Are we networking adequately to find blue ribbon S&E minority students? Examples: networks with minority serving institutions such as historically black colleges and universities, minority-serving Hispanic institutions, Indian-serving community colleges. Also, minority-serving professional associations, e.g., CAUSA, AISES, NACME.* | | |
| *6. Do we support student chapters of minority-serving professional organizations, e.g., CAUSA, AISES, NACME, on our campus?* | | |
| *7. Do we begin the mentoring process with our blue ribbon S&E minority students the day they come to the campus? While they are still in high school?* | | |

| | | |
|---|---|---|
| ***8. Do we encourage undergraduate research for blue ribbon S&E minority students, e.g., as assistants in laboratories, as researchers in off-campus summer sites, e.g, AT&T, NASA et al?*** | | |
| ***9. Do we underwrite blue ribbon S&E minority student travel to conferences of professionals in their chosen fields?*** | | |
| ***10. Do we begin early to help blue ribbon S&E minority undergraduate students to line up fellowships and assistantships for doctoral study?*** | | |
| ***11. Have we made application for federal and foundation grants to support our work with blue ribbon S&E minority students, e.g., NASA-USRP; Hughes-BRT; NIH-MARC; NIH-RMC; NIH-MBRS; McNair Fellowships; NSF-YSP; NSF Fellowships;, McKnight Fellowships;, Ford Foundation Fellowships; General Electric Fellowships?*** | | |
| ***12. Do we follow-up our blue ribbon S&E minority graduates who go on to become doctoral starts and use this feedback to try to improve what we do here.*** | | |

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# *Appendix A*

## *Colleges of Baccalaureate Origin*

## Listing of Baccalaureate Colleges of Origin: Indians

### Top Ten Institutions

University of Oklahoma
Oklahoma State University
University of California-Berkeley
University of Michigan
University of Montana
University of Colorado-Boulder
Cornell University
University of Illinois/Urbana - Champagne
University of Central Oklahoma
Northeastern State University/OK

### Second Tier Institutions

Western Washington University
California State University-Long Beach
University of California-Los Angeles
University of California-Santa Barbara
Princeton Universtiy
Purdue University
University of Wisconsin-Madison
Iowa State University
West Virginia University
University of Arkansas-Fayetteville
University of Texas-Arlington
University of Arizona
University of California-Davis
Harvard University
University of Massachussetts-Amherst
Brooklyn College-CUNY
Columbia University
State University of New York at Buffalo
Syracuse University
Vassar College
Rutgers University
Lehigh University
Penn State University
University of Pittsburgh
Miami University/Ohio
Ball State University
Indiana University
SE Missouri State University
University of South Dakota
University of Nebraska-Lincoln
Kansas State University
University of Kansas
Loyola College/MD
Georgetown University
University of Virginia
North Carolina State University-Raleigh
Pembroke State University/NC
University of Florida
Florida Atlantic University
Florida State University
Auburn University
East Central University/OK
Texas A&M University
Texas Tech University
University of Texas-Austin
Montana State University
New Mexico State University
Northern Arizona University
University of Utah
Utah State University
University of Washington
Oregon State University
Cal Poly State University-San Luis Obispo
California State University-Fullerton
University of California-Riverside
University of California-San Diego
University of California-Santa Cruz
Harvey Mudd College

## Other Institutions

University of Maine
Boston College
College of the Holy Cross
University of Massachussetts-Dartmouth
Tufts University
Western New England College/MA
Eastern Connecticut State University
Fairfield University/CT
Alfred University/NY
Clarkson University/NY
Columbia-Barnard/NY
New York University
Pace University/NY
University of Rochester/NY
St. Lawrence University/NY
Siena College/NY
SUNY at Albany
SUNY College-Brockport
SUNY College-Oneonta
SUNY College-Potsdam
SUNY Empire State College
Fairleigh Dickinson University/NJ
Bryn Mawr College/PA
Delaware Valley College/PA
Drexel University/PA
East Stroudsburg University/PA
Edinboro University of Pennsylvania
Geneva College/PA
Marywood College/PA
University of Pennsylvania
St. Joseph's University/PA
Slippery Rock University/PA
Swarthmore College/PA
Bowling Green State University/OH
Cleveland State University/OH
John Carroll University/OH
Indiana-Purdue University-Ft. Wayne
Valparaiso University/IN
Augustana College/IL
Illinois State University
University of Illinois-Chicago
Millikin University/IL
Northwestern University/IL
Southern Illinois University
Michigan State University
Michigan Technical University
University of Michigan-Flint
Oakland University/MI
Western Michigan University
Beloit College/WI
Lakeland College/WI
University of Wisconsin-Milwaukee
University of Wisconsin-Oshkosh
MacAlester College/MN
Mankato State University/MN
University of Minnesota-Duluth
St. Olaf College/MN
Central University of Iowa
University of Iowa
St. Ambrose University/IA
University of Missouri-Kansas City
University of Missouri-Rolla
North Dakota State University
Black Hills State University/SD
South Dakota State Mine & Tech
Emporia State University/KS
Wichita State University/KS
University of Delaware
US Naval Academy
George Mason University/VA
University of Richmond/VA
Virginia Military Institute
West Liberty State College/WV
Davidson College/NC
Guilford College/NC
University of North Carolina-Chapel Hill
Appalachian State University/NC
Clemson University/SC
Wofford College/SC
Emory University/GA
Georgia State University
North Georgia College
New College-South Florida University
Jacksonville University/FL
Christian Brothers University/TN
University of Tennessee-Knoxville
University of Tennessee-Chattanooga
Vanderbilt University/TN
University of Alabama-Birmingham
University of Alabama-Huntsville
Delta State University/MS
University of Mississippi
University of Central Arkansas
Louisiana State University & A&M College

## Other Institutions - Continued

Louisiana State University-Shreveport
Loyola University/LA
McNeese State University/LA
Oklahoma Baptist University
Oklahoma Christian University
Oral Roberts University/OK
Southwestern Oklahoma State University
Rice University/TX
University of Texas/Permian Basin
University of Texas/San Antonio
Texas Woman's University
Eastern Montana College
Fort Lewis College/CO
University of New Mexico
Brigham Young University/UT
Pacific Lutheran University/WA
Walla Walla College/WA
George Fox College/OR
Portland State University/OR
Southern Oregon State College
California Institute of the Arts
California State Polytechnic-Pomona
California State University-Bakersfield
California State University-Chico
California State University-Fresno
California State University-Los Angeles
San Diego State University/CA
Humboldt State University/CA
Sonoma State University/CA
Clairmont McKenna College/CA
Thomas Aquinas College/CA

## Listing of Baccalaureate Colleges of Origin: Hispanics

### Top Ten Institutions

University of Puerto Rico-Rio Piedras
University of Puerto Rico-Mayaguez
University of California-Berkeley
University of California-Los Angeles
University of New Mexico
University of Texas-Austin
University of Miami/FL
Cornell University/NY
University of California-Santa Barbara
University of Florida

### Second Tier Institutions

Harvard University
Texas A&M University
Massachussetts Institute of Technology
New York University
Catholic University of Puerto Rico
Stanford University
Princeton University
University of California-San Diego
Rutgers University
City College-CUNY
University of South Florida
University of California-Irvine
University of Southern California
Florida International University
University of Texas-El Paso
California State University-Los Angeles
University of California-Santa Cruz
University of California-Davis
University of Arizona
I Amer University-San Germ/PR
Hunter College-CUNY
Fordham University
Georgia Institute of Technology
New Mexico State University
University of Illinois / Urbana-Champagne
University of Maryland
Arizona State University
University of California-Riverside
California State University-Northridge
Michigan State University
Yale University
Florida State University
St. Mary's University/TX
California Institute of Technology
California State University-Fullerton
California State University-Long Beach
Brown University
University of Notre Dame
University of Wisconsin-Madison
Johns Hopkins University
Louisiana State University & A&M College
Rice University
California State University-Fresno
San Francisco State University
San Jose State University
Loyola Marymont University/CA
Brooklyn College-CUNY
Lehman College-CUNY
Columbia-Barnard/NY
University of Michigan
Georgetown University
Duke University
Tulane University of Louisiana
University of Texas-San Antonio
Trinity University/TX
University of Washington
Boston University
Columbia University
SUNY at Stony Brook
Case Western Reserve
University of Illinois-Chicago
Northwestern University/IL
University of Minnesota-Minneapolis
Iowa State University
VA Polytechnic Institute & State University
University of Oklahoma
Texas Tech University
Colorado State University
University of Colorado-Boulder
New Mexico Highlands University

**Second Tier Institutions - Continued**

Brigham Young University
University of Utah
California State Polytechnic-Pomona
Cayey University College-University of PR
Queens College-CUNY
SUNY at Albany
SUNY at Buffalo
Syracuse University
St. Peters College/NJ
Ohio State University
University of Kansas
Cal Poly State University-San Luis Obispo
San Diego State University
Humbolt State University
Whittier College
University of Hawaii
University of Rochester/NY
Carnegie Mellon University/PA
Pennsylvania State University
University of Pittsburgh
Swarthmore College/PA
Loyola University of Chicago
Marquette University/WI
George Washington University/DC
University of Virginia
University of Houston
University of San Francisco
Clark University
Smith College/MA
Wellesley College/MA
Vassar College/NY
University of Pennsylvania
Indiana University
Kalamazoo College/MI
Carleton College/MN
St. Louis University
Washington University
Kansas State University
University of South Carolina
Barry University/FL
Florida Atlantic University
Loyola University/LA
University of North Texas
Texas A&M University
University of Denver
University of Nevada
Loma Linda University/CA
Santa Clara University/CA
Cooper Union/NY
St. Johns University-Queens/NY
SUNY College-Purchase
Bryn Mawr College/PA
Temple University/PA
University of Cincinnati/OH
Miami University/OH
University of Toledo/OH
College of Wooster/OH
Wright State University/OH
Purdue University/IN
University of Chicago/IL
Illinois State University-Normal
Northern Illinois University
Wayne State University/MI
Western Michigan University
University of Missouri-Rolla
Catholic University of America/DC
University of North Carolina-Chapel Hill
North Carolina State University-Raleigh
University of Georgia
Florida Institute of Technology
University of Central Florida
University of Tampa/FL
University of New Orleans/LA
University of Texas-Pan American
University of Northern Colorado
Northern Arizona University
Washington State University
University of Oregon
Oregon State University
California State University-Carson
California State University-Hayward
California State University-Sacramento
Pomona College/CA
University of the Sacred Heart/PR
Dartmouth College/NH
Boston College/MA
Brandeis University/MA
University of Massachussetts-Amherst
University of Massachussetts-Lowell
Tufts Massachussetts/MA
University of Bridgeport/CT
Central Connecticut State University
University of Connecticut
Trinity College/CT

## Second Tier Institutions - Continued

Bard College/NY
Clarkson University/NY
Hofstra University/NY
Manhattan College/NY
Polytechnic University/NY
Rensselaer Polytechnic Institute/NY
St. Francis College/NY
SUNY at Binghamton
SUNY College-Cortland
US Military Academy
Wagner College/NY
Fairleigh Dickinson University/NJ
Albright College/PA
Dickinson College/PA
Franklin & Marshall College/PA
Haverford College/PA
University of Akron/OH
University of Dayton/PA
Manchester College/IN
Southern Illinois University
Beloit College/WI
University of Wisconsin-La Crosse
Bethel College/MN
University of Iowa
University of Missouri-Columbia
University of Nebraska-Lincoln
College of Notre Dame Maryland
Howard University/DC
George Mason University/VA
James Madison University/VA
Old Dominion University/VA
Wake Forest University/NC
College of Charleston/SC
Furman University/SC
Augusta College/GA
Emory University/GA
Austin Peay State University/TN
Vanderbilt University/TN
University of Montevallo/AL
University of Central Oklahoma
Oklahoma State University
Oklahoma University-Health Science
Baylor University/TX
University of Dallas/TX
Incarnate Word College/TX
Lamar University/TX
Our Lady of the Lake University/TX
St. Edward's University/TX
Southern Methodist University/TX
S F Austin State University/TX
Texas A&M Corpus Christy
Texas University Med Br-Galveston
Texas Woman's University
Boise State University/ID
Colorado College
Fort Lewis College/CO
USAF Academy/CO
New Mexico Inst. Mining & Tech.
Portland State University/OR
University of California-San Diego, Medical
Pacific Union College/CA
University of the Pacific/CA
University of Redlands/CA
St. Marys College California
Catholic University Puerto Rico-AREC
Humacao University College-Univ PR

## Other Institutions

Bates College/ME
Colby College/ME
University of Maine-Orono
University of Maine-Farmington
University of New Hampshire
Bennington College/VT
Lyndon State College/VT
Middlebury College/VT
Norwich University/VT
Amherst College/MA
Anna Maria College/MA
Curry College/MA
Hampshire College/MA
College of the Holy Cross/MA
University of Massachussetts-Boston
University of Massachussetts-Dartmouth
Mt. Holyoke College/MA
Northeastern University/MA
Simmons College/MA
Springfield College/MA

## Other Institutions - Continued

Worcester Polytechnic Institute/MA
University of Rhode Island
Connecticut College
Adelphi University/NY
Alfred University/NY
Baruch College-CUNY
York College-CUNY
Harriman College/NY
Houghton College/NY
Iona College/NY
Julliard School/NY
Le Moyne College/NY
Long Island Univ-Brooklyn Campus/NY
Long Island Univ-Schwartz Phar/NY
Long Island Univ-Southampton College/NY
Marist College/NY
Marymount Manhattan/NY
Mercy College/NY
College of Mt St Vincent/NY
New School of Social Research/NY
St Josephs College/NY
St Lawrence University/NY
SUNY College-Brockport
SUNY College-New Paltz
SUNY College-Old Westbury
SUNY College-Oneonta
SUNY College-Oswego
SUNY College-Plattsburg
SUNY College-Pottsdam
SUNY Empire State College
New York-Unknown Inst
Bloomfield College/NJ
Jersey City State College/NJ
Kean College/NJ
Stockton College of New Jersey
Seton Hall University/NJ
Stevens Institute of Technology/NJ
Thomas Edison State College/NJ
Beaver College/PA
Bloomsburg University of Pennsylvania
Chatham College/PA
Drexel College/PA
Geneva College/PA
Gettysburg College/PA
Juniata College/PA
La Salle University/PA
Lehigh University/PA
Lock Haven University/PA
Pennsylvania State-Erie Behrend
Shippensburg University of Pennsylvania
Slippery Rock University/PA
Ursinus College/PA
Villanova University/PA
Washington & Jefferson College/PA
Bowkling Green State University/OH
Kent State University/OH
Muskingum College/OH
Notre Dame College/OH
Ohio University
University of Toledo/OH
Walsh University/OH
Ball State University/IN
Butler University/IN
Earlham College/IN
University of Evansville/IN
Indiana University-Northwest
Indiana University-South Bend
St Josephs College/IN
St Marys College/IN
Bradley University/IL
Childrens Memorial Hospital/IL
Greenville College/IL
Illinois Institute of Technology
Illinois Wesleyan University
McKendree College/IL
Monmouth College/IL
Northeastern Illinois University
College of St Francis/IL
Western Illinois University
Wheaton College/IL
Albion College/MI
Andrews University/MI
Calvin College/MI
Eastern Michigan University
Michigan Technical University
Olivet College/MI
Lawrence University/WI
Northland College/WI
University of Wisconsin-Milwaukee
University of Wisconsin-Oshkosh
Macalester College/MN
College of St Catherine/MN
University of St Thomas/MN
Buena Vista College/IA

## Other Institutions - Continued

Upper Iowa University
Maharishi International University/IA
Northwest Missouri State University
North Dakota State University
University of North Dakota
South Dakota State Mine & Technology
South Dakota State University
Nebraska Wesleyan University
Emporia State University/KS
Wichita State University/KS
University of Delaware
Bowie State University/MD
Peabody Institute-Johns Hopkins/MD
University of Maryland-Eastern Shore
University of Maryland-Overseas
University of Maryland-Unknown
St Johns College/MD
St Marys College of Maryland
St Marys Seminary & University/MD
US Naval Academy/MD
American University/DC
Bridgewater College/VA
Mary Baldwin College/MD
Mary Washington College/VA
Virginia Commonwealth University
Virginia Military Institute
College of William & Mary/VA
Fairmont State College/WV
University of North Carolina-Asheville
East Carolina University/NC
Appalachian State University/NC
The Citadel/SC
Claflin College/SC
Georgia State University
Oglethorpe University/GA
St Thomas University/FL
Florida Southern College
Rollins College/FL
Stetson University/FL
Eastern Kentucky University
University of Kentucky
University of Louisville/KY
Morehead State University/KY
Thomas More College/KY
East Tennessee State University
King College/TN
Maryville College/TN
University of Memphis/TN
Rhodes College/TN
Tennessee Technical University
University of Tennessee/Knoxville
University of Alabama
Athens State College/AL
Oakwood College/AL
Mississippi College
Mississippi State University
University of Arkansas-Little Rock
Hendrix College/AR
Northwestern State University/LA
Tulane University-Newcomb College/LA
Southwestern Oklahoma State University
University of Tulsa/OK
Angelo State University/TX
Jarvis Christian College/TX
Southwest Texas State University
SUL Ross State University/TX
Texas A&M International University
Texas Christian University
Texas Lutheran College
University of Texas-Permian Basin
University of Texas-Brownsville
University of Texas
University of Montana
Idaho State University
University of Wyoming
Adams State College/CO
Colorado School of Mines
University of Colorado-Cold Springs
Denver General Hospital/CO
Metropolitan State College/CO
Regis University/CO
College of Santa Fe/NM
Utah State University
Weber State University/UT
Eastern Washington University/WA
Gonzaga University/WA
Pacific Lutheran University/WA
Seattle University/WA
Western Washington University
Whitman College/WA
Whitworth College/WA
Evergreen State College/WA
Reed College/OR
California State University-Chico

## Other Institutions - Continued

California State University-San Bernadino
California State University-Stanislaus
Sonoma State University/CA
University of California-Irvine, Coll MD
University of California-San Francisco
Harvey Mudd College/CA
Pitzer College/CA
Scripps College/CA
Tomas Rivera Center/CA
Mills College/CA
Occidental College/CA
Point Loma Naza College/CA
Pepperdine University/CA
St Johns Smeinary-College/CA
Westmont College/CA
Antioch College West/CA
Fresno Pacific College/CA
California State Prof Psy-Fresno
Evangelical Seminary/PR
Inter American University-Metro/PR
Antillian Advnt University/PR
Turabo University/PR

## Listing of Baccalaureate Colleges of Origin: Blacks

### Top Ten Institutions

Howard University/DC
Spelman College/GA
Hampton University/VA
Tuskegee Univesity/AL
North Carolina A&T State Univ.
University of Maryland
Fisk University/TN
Mass. Institute of Technology
University of Michigan
Harvard University/MA

### Second Tier Institutions

City College-CUNY
University of Pennsylvania
Jackson State University/MS
Southern University/LA
Princeton University/NJ
Lincoln University/PA
Morehouse College/GA
Brown University/RI
Cornell University/NY
North Carolina Central University
Univ. of California-Los Angeles
SUNY at Buffalo
University of Ill/Urbana-Champagne
Wayne State Unversity/MI
Florida State University
Tennessee State University
South Carolina State University
Yale University/CT
Rutgers University/NJ
University of Virginia
North Carolina State University-Raleigh
Xavier University/LA
University of California-Berkeley
University of Cincinnati/OH
Virginia State University
Univ of North Carolina-Chapel Hill
Florida A&M University
University of Houston/TX
University of Texas-Austin
Temple University/PA
Oberlin College/OH
Ohio State University
Northwestern University/IL
Michigan State University
University of the District of Columbia
Tougaloo College/MS
Stanford University/CA
Dartmouth College/NH
Boston University/MA
Hunter College-CUNY
Columbia University/NY
Southern Illinois University
Virginia Commonwealth University
California State University-Los Angeles
University of California-San Diego
University of Massachussetts-Amherst
New York University
Indiana University-Bloomington
Purdue University/IN
Chicago State University/IL
Washington University/MO
University of Alabama
Mississippi State University
Dillard University/LA
York College-CUNY
Rensselaer Polytechnic Inst/NY
SUNY at Stonybrook
Carnegie Mellon University/PA
University of Chicago/IL
Roosevelt University/IL
Western Michigan University
Clark Atlanta University/GA
Georgia State University
University of Florida
Talladega College/AL
University of Southwestern Louisiana
Prairie View AM/TX
University of California-Irvine
Mount Holyoke College/MA
University of Connecticut

## Second Tier Institutions - Continued

Brooklyn College-CUNY
University of Rochester/NY
University of Notre Dame/IN
Bradley University/IL
University of Illinois-Chicago
University of Detroit-Mercy/MI
Morgan State University/MD
Georgetown University/DC
Winston-Salem State University/NC
University of South Carolina
Oakwood College/AL
Grambling State University/LA
University fo Oklahoma
San Francisco State University/CA
San Jose State University/CA
University of Southern California
Amherst College/MA
Smith College/MA
Wellesley College/MA
Fordham University/NY
Pennsylvania State University
University of Pittsburgh
Swarthmore College/PA
Xavier University/OH
Northern Illinois University
University of Missouri-Columbia
University of Delaware
Old Dominion University/VA
Duke University/NC
Johnson C. Smith Unuiversity/NC
Georgia Institute of Technology
Mercer University/GA
Bethune-Cookman College/FL
Berea College/KY
University of Louisville/KY
Vanderbilt University/TN
Alabama A&M University
Louisiana State Univ. & A&M College
Oklahoma State University
Rice University/TX
Texas Southern University
Texas Woman's University
University of Colorado-Boulder
University of California-Santa Barbara
Tufts University/MA
Baruch College-CUNY
Queens College-CUNY
Long Island University-Brooklyn Campus/NY
US Military Academy/NY
Vassar College/NY
Case Western Reserve/OH
Illinois State University-Normal
Andrews University/MI
Carleton College/MN
University of Nebraska-Omaha
University of Kansas
George Washington University/DC
Virginia Union University
Bennett College/NC
East Carolina University/NC
Fayetteville State University/NC
Emory University/GA
Savannah State College/GA
University of Central Florida/FL
University of Memphis/TN
University of Tennessee-Knoxville
University of Alabama-Birmingham
University of Mississippi
University of Arkansas-Fayetteville
California Institute of Technology
California State University-Carson
California State University-Northridge
University of the Virgin Islands
Northeastern University/MA
Williams College/MA
Wesleyan University/CT
Columbia-Barnard/NY
Manhattanville College/NY
Pratt Institute/NY
SUNY at Albany
SUNY College Oneonta
Syracuse University/NY
Kean College New Jersey
Bryn Mawr College/PA
Cheney University of Pennsylvania
Antioch College/OH
Central State University/OH
University of Dayton/OH
Ohio University
College of Wooster/OH
Anderson University/IN
University of Evansville/IN
Valparaiso University/IN
DePaul University/IL

## Second Tier Institutions - Continued

Beloit College/WI
University of Wisconsin-Madison
University of Wisconsin-Whitewater
Iowa State University
University of Nebraska-Lincoln
Bowie State University/MD
Columbia Union College/MD
Johns Hopkins University/MD
US Naval Academy/MD
Norfolk State University/VA
West Virginia University
University of North Carolina-Greensboro
Shaw University/NC
Clemson University/SC
Winthrop University/SC
Fort Valley State College/GA
Paine College/GA
University of Miami/FL
Murray State University/KY
Auburn University/AL
Stillman College/AL
University of Southern Mississippi
University of Arkansas-Pine Bluff
University of New Orleans/LA
University of Arizona
Portland State University/OR
California State University-Long Beach
San Diego State University/CA
University of California-Davis
University of California-Santa Cruz
Pepperdine University/CA
Bates College/ME
Clark University/MA
Hampshire College/MA
College of the Holy Cross/MA
Canisius College/NY
John Jay College-CUNY
Le Moyne College/NY
Manhattan College/NY
St Francis College/NY
SUNY at Binghamton
SUNY College Westbury
SUNY College Purchase
Fairleigh Dickinson University/NJ
Seton Hall University/NJ
Drexel University/PA
Eastern College/PA
St Josephs University/PA
Cleveland State University/OH
Miami University/OH
University of Toledo/OH
Illinois Benedictine College
Illinois Wesleyan University
Loyola University Chicago/IL
Southern Illinois University-Edwardsville
Calvin College/MI
Eastern Michigan University
Oakland University/MI
Lawrence University/WI
Marquette University/WI
University of Wisconsin-Milwaukee
University of Iowa
Harris-Stowe State College/MO
Park College/MO
Rockhurst College/MO
St Louis University/MO
Kansas State University
Delaware State University
University of Maryland, School of Medicine
American University/DC
Virginia Polytechnic Institute & State Univ
University of North Carolina-Asheville
Appalachian State University/NC
Western Carolina University/NC
Wake Forest University/NC
Benedict College/SC
Francis Marion University/SC
Wofford College/SC
Albany State College/GA
University of Georgia
Morris Brown College/GA
Florida International University
University of South Florida
Eastern Kentucky University
University of Kentucky
East Tennessee State University
Knoxville College/TN
Alabama State University
Troy State University/AL
Alcorn State University/MS
Delta State University/MS
Rust College/MS
Arkansas University-Medical Sciences
University of Arkansas-Little Rock

## Second Tier Institutions - Continued

Loyola University/LA
McNeese State University/LA
Northeast Louisiana University
University of Central Oklahoma
Langston University/OK
Oklahoma City University
Baylor University/TX
East Texas State University
Texas A&M University-Kingville
University of Texas-El Paso
University of Texas-San Antonio
University of New Mexico
Washington State University
California State University-Fullerton
California State University-Hayward
University of California-Irvine, Coll of Med
Chapman University/CA
Loma Linda University/CA
Loyola Marymont University/CA
Mills College/CA
Mt St Marys College/CA
University of Hawaii

## Other Universities

Bowdoin College/ME
Colby College/ME
St Josephs College/ME
Goddard College/VT
Middlebury College/VT
Emerson College/MA
Gordon College/MA
Radcliffe College/MA
University of Massachussetts-Lowell
University of Rhode Island
Connecticut College
Fairfield University/CT
Gateway Community-Technical/CT
Western Connecticut State University
Adlephi University/NY
Bard College/NY
CUNY-Graduate School & Univ Ctr
Lehman College-CUNY
College of Staten Island-CUNY
Hartwick College/NY
Hobart & William Smith College/NY
Hofstra University/NY
Ithaca College/NY
Long Island University-Schwartz Phar/NY
Long Island University-C W Post Cmps/NY
Long Island University-Unk/NY
College of New Rochelle/NY
New School of Social Research/NY
New York Institute of Technology
New York Institute of Technology-Ctrl Islip
Niagara University/NY
Pace University/NY
St Lawrence University/NY
SUNY College Brockport
SUNY College New Paltz
Syracuse University-Utica/NY
Union College/NY
Rowan College/NJ
Jersey City State College/NJ
New Jersey Institute of Technology
R Stockton College of New Jersey
Stevens Institute of Technology/NJ
Upsala College/NJ
California University of Pennsylvania
Chatham College/PA
Dickinson College/PA
Duquesne University/PA
Elizabethtown College/PA
Franklin & Marshall College/PA
Gannon University/PA
Haverford College/PA
Kutztown University/PA
Lancaster Theological Seminary/PA
Lehigh University/PA
Seton Hill College/PA
Shippensburg University of Pennsylvania
Reform Presbyterian Seminary/PA
Villanova University/PA
Widener University/PA
Baldwin-Wallace College/OH
Bowling Green State University/OH
Denison University/OH
Mt Union College/OH
Notre Dame College/OH

## Other Institutions - Continued

Ohio Wesleyan University
Wilberforce University/OH
Wittenberg University/OH
Wright State University/OH
Youngstown State University/OH
Earlham College/IN
Hanover College/IN
Indiana University-School of Medicine
Indiana-Purdue University-Indianapolis
Indiana Univ-Purdue Univ - Science & Engr
Eastern Illinois University
Eureka College/IL
Governors State University/IL
Illinois Institute of Technology
Lake Forest College/IL
Monmouth College/IL
Northeastern Illinois University
Olivet Nazarene University/IL
St Xavier University/IL
Wheaton College/IL
Alma College/MI
Central Michigan University
GMI Engineering & Management Inst/MI
Grand Valley State University/MI
Hope College/MI
Kalamazoo College/MI
Marygrove College/MI
Carthage College/WI
Concordia University/WI
University of Wisconsin-Eau Calire
Hamline University/MN
Mankato State University/MN
University of Minnesota-Minneapolis
Cornell College/IA
University of Dubuque/IA
Graceland College/IA
Grinnell College/IA
Central Methodist College/MO
Central Missouri State University
Lincoln University/MO
University of Missouri-Kansas City
University of Missouri-St Louis
Southwest Missouri State University
Webster University/MO
Black Hills State University/SD
Bellevue College/NE
Creighton University/NE
University of Nebraska-Kearney
St Mary College/KS
University of Baltimore/MD
University of Maryland-Baltimore County
University of Maryland-Eastern Shore
Towson State University/MD
Washington College/MD
Catholic University of America/DC
Randolph-Macon College/VA
Roanoke College/VA
Sweet Briar College/VA
Virginia Commonwealth Univ Med College
College of William & Mary/VA
Christopher Newport/VA
Marshall University/WV
Davidson College/NC
Livingstone College/NC
University of North Carolina-Charlotte
University of North Carolina-Wilmington
Elizabeth City State University/NC
St Augustines College/NC
Allen University/SC
Bob Jones University/SC
College of Charleston/SC
The Citadel/SC
Claflin College/SC
Columbia College/SC
Limestone College/SC
Presbyterian College/SC
University of South Carolina-Spartanburg
Voorhees College/SC
Armstrong State College/GA
Brenau University/GA
Emmanuel College/GA
Georgia Southern University
Oglethorpe University/GA
Emery-Riddle University/FL
Florida Institute of Technology
Florida Memorial College
Florida Atlantic University
Univ of Southern Florida College of Medicine
Jacksonville University/FL
Thomas More College/KY
Western Kentucky University
Christian Brothers University/TN
David Lipscomb University/TN
Freed-Hardeman College/TN

## Other Institutions - Continued

Lambuth University/TN
Lee College/TN
Lemoyne-Owen College/TN
Meharry Medical College/TN
Middle Tennessee State University
Southern College/TN
Rhodes College/TN
Tennessee Technical University
University of Tennessee-Chattanooga
University of Tennessee-Martin
University of Alabama-Huntsville
Huntingdon College/AL
Miles College/AL
Samford University/AL
Millsaps College/MS
Mississippi College
Mississippi University for Women
Mississippi Valley State University
William Carey College/MS
Wood College/MS
University of Central Arkansas
Henderson State University/AR
Southern Arkansas University
Nicholls State University/LA
St Joseph Seminary College/LA
Southern University-New Orleans/LA
Tulane University of Louisiana
Oklahoma Baptist University
Oral Roberts University/OK
Southwestern Oklahoma State University
Incarnate Word College/TX
Jarvis Christian College/TX
University of North Texas
Paul Quinn College/TX
St Edward's University/TX
University of St Thomas/TX
Sam Houston State University/TX
Southern Methodist University/TX
Southwest Texas State University
Texas A&M University
Texas Christian University
Texas Tech University
University of Texas-Arlington
Texas University Medical Branch-Galveston
Texas Wesleyan University
Wiley College/TX
Montana State University
University of Wyoming
Adams State College/CO
University of Denver/CO
University of Southern Colorado
USAF Academy/CO
Eastern New Mexico University
New Mexico State University
College of Santa Fe/NM
Arizona State University
University of Nevada
Eastern Washington University/WA
Pacific Lutheran University/WA
University of Puget Sound/WA
Walla Walla College/WA
Whitworth College/WA
Lewis & Clark College/OR
University of Oregon
Oregon State University
Southern Oregon State College
California Poly State Univ-San Luis Obispo
California State University-Bakersfield
California State University-Chico
California State University-Fresno
University of California-Riverside
University of California-San Diego, Medical
Claremont McKenna College/CA
University of La Verne/CA
Loma Linda University/CA
Occidental College/CA
Pacific Union College/CA
University of Redlands/CA
University of San Francisco/CA
Santa Clara University/CA
Southern California College
Westmont College/CA
Whittier College/CA
Antioch College West/CA
Fresno Pacific College/CA
International Inst of America/PR

# *Appendix B*

## *Selected Program Descriptions*

# *Morgan State University*
# *Summer S&E Enrichment Program*

## SUMMER CAMP TRAIL QUOTES
## SUMMER ENRICHMENT

In the summer enrichment program, SEMPREP, I learned different algebra topics, such as integers, square roots, exponents and variables. I thought that I could never be successful in learning about them. But I did learn. I learned to simplify number and algebra equations. To simplify means to make an equation simple or easier. I also learned that in order to be successful that I must stay focused and think about my thinking. This is called metacognition. To solve my algebra equations, I used strategies that involved the use of cubes, chips, puzzles, number lines and drawings.

The science class was very interesting also. We performed several experiments. The one that sticks with me the most is identifying indicators in various substances. My computer class taught me how rockets are built and offered lots of practice with mathematics problems. At the beginning of the program my attitude towards math was negative and pessimistic, but it has changed now since I understand higher level mathematics.

Sywanda Atkinson
Grade 6
Rognel Heights Elementary School #89

**************************************

The things I like best about summer camp are as follows: Summer camp gives me a clear understanding of the math skills I did not master when school was in session. I like to come and talk with my fellow classmates before class session starts. I like the educational games played in class that give me a clear understanding of things we have learned in class. Of all the things I like in this summer camp, I really enjoy playing educational games that will help me later on in my life. To conclude this paragraph I end in saying that this, I believe, will be the most successful math program I've ever attended.

Jade Merritt
Grade 7
Fallstaff Middle School #241

*Connecticut Pre-Engineering Program*

*CPEP*

cpep

Connecticut
Pre-Engineering
Program, Inc.




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## Organized for Success

CPEP began in 1986 with just one Hartford school and 47 students. Today, CPEP includes more than 600 pupils from 21 schools in the state's seven largest cities—Bridgeport, Danbury, Hartford, New Britain, New Haven, Stamford and Waterbury.

Under the auspices of the Science Center of Connecticut, in collaboration with private, public, non-profit and government groups, CPEP was founded on the belief that inner-city children represent a rich resource of future business and community leaders: engineers, mathematicians, scientists, teachers, actuaries, architects and professionals of every stripe.

## Flexible Structure, Comprehensive Support

With an executive director at the Science Center, a site administrator in each school district and a teacher coordinator at each school, CPEP's organization has the flexibility to respond quickly to the needs of local schools and individual students without the delay of cumbersome bureaucracies.

CPEP sets the after-school educational agenda; hires teachers and assistants; purchases classroom materials and equipment; recruits volunteer mentors from businesses and colleges; arranges field trips and provides transportation to museums, colleges and companies; assists with science fairs; and sponsors academic competitions.

The program also funds training for faculty; provides guidance to students and their parents; and introduces students to successful minority professionals, who are powerful role models.

When CPEP students graduate, the program assists them in gaining admission to quality post-secondary schools and in finding the financial resources they need to attend.

Moreover, CPEP complements other challenging, minority development programs like Worcester Polytechnic Institute's highly selective Project STRIVE and the nationally renowned INROADS, Inc. A number of CPEP students participate in one or both of these programs, which, through corporate and institutional sponsors, support students academically and financially during their transition from high school, through college and business internships, to their initial professional placement.

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Taking the classroom out into the world is another of CPEP's goals. Here, New Haven students (from left) David Clemmons, Cuong Banh and Todd Law examine marine life captured from the Mystic area of Long Island Sound while aboard the schooner *Argia*.

## "I'm Going to Invent Things"

For 16-year-old Giovanni Vazquez, a senior at Bulkeley, CPEP has helped him heed his father's advice. "My father is an electrician, and since I was five years old, I've gone out on jobs with him whenever I could," Giovanni said. "But he always tells me, 'Be something more.'" Giovanni is determined to be an engineer.

A native of Puerto Rico, Giovanni moved with his family to Hartford during his junior year of high school. At the suggestion of a guidance counsellor, he joined CPEP almost immediately. Every day, he says, the program reaffirms his desire to be an engineer. Yet, it also has changed his perception of that profession.

At first, Giovanni thought of engineering as just a promising career. Now, when he talks about engineering he asserts, "I'm going to invent things."

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"I believe these kids will make great engineers. Now I've got to make them believe it."

You'd think getting a bunch of teenagers to study engineering in their free time would be impossible. But Al Ware, of General Motors' Vehicle Launch Center, helped get 5,000 students enrolled in the Detroit Area Pre-College Engineering Program this year. They take advanced science and math courses. They do engineering projects like building a full-scale moveable car entirely from paper. And they learn they can solve just about any problem they set their minds to solve. Al says, "The more we put into this community, the more we'll get out of it." He's right. Because some former teenagers he inspired are designing better automobiles at GM today.

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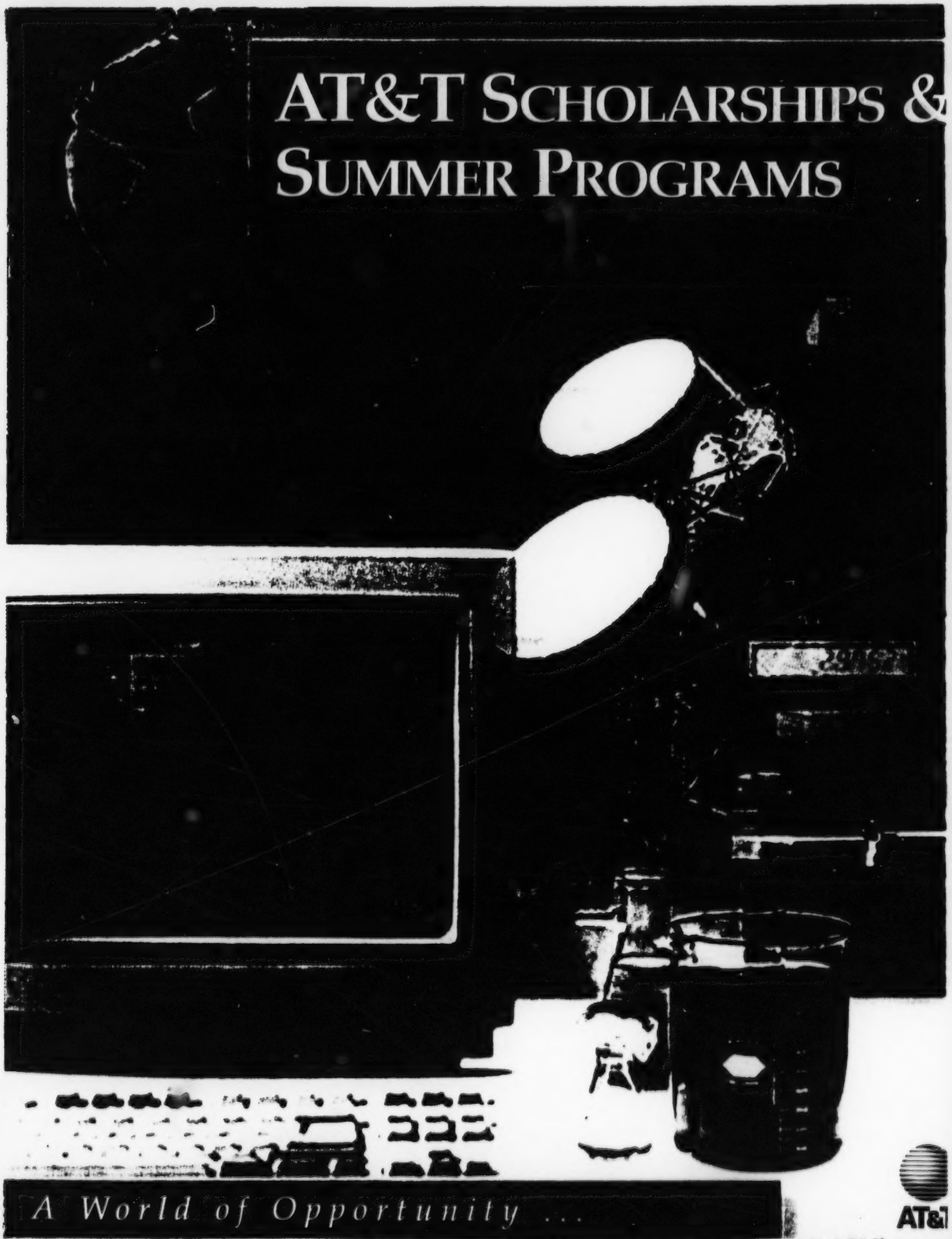




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# AT&T Scholarships & Summer Programs

## Cooperative Research Fellowship Program (CRFP)

The objective of the CRFP is to develop scientific and engineering ability among members of those minority groups underrepresented in science. The fellowship provides all tuition, university fees, books, an annual living stipend of $13,200, and related travel expenses. In addition, during the summer preceding graduate work, fellowship recipients are employed at AT&T-Bell Laboratories and are assigned an appropriate research mentor. College seniors who will be pursuing a PhD degree in the disciplines listed in the center of this brochure may apply. For information on applying, call 908-582-4822.

## Dual Degree Scholarship Program (DDSP)

The DDSP is designed to encourage talented minorities to enter the field of Engineering. Through a coordinated effort with The Atlanta University Center, Dual Degree scholars earn a BA in Math or Physics from Spelman, Morehouse, Clark, or Morris Brown Colleges in 3 years and then go on to earn a BS degree in Engineering or Computer Science. This second degree may be earned from Georgia Institute of Technology, Auburn University, Rochester Institute of Technology, University of Alabama, or Boston University over a 2 year period. The DDSP provides full tuition, books, fees, room and board, a challenging summer job each year at AT&T and an appropriate mentor. Participation in this program is by invitation only.

## Graduate Research Program for Women (GRPW)

GRPW is designed to identify and develop scientific and engineering research ability in women and to increase the representation of women in these fields. The program provides support for outstanding students pursuing full-time doctoral studies in the disciplines listed in the center of this brochure. The program consists of two types of awards: fellowships and grants. The fellowship provides an annual living stipend of $13,200, full tuition and fees, textbook allowance, summer employment and an AT&T Bell Laboratories scientist as a mentor. The grant provides $1,500 annually, to be used by the recipient the following year in any way that benefits her professional development. Grant recipients are also eligible for summer employment and are assigned an AT&T Bell Laboratories scientist as a mentor. For additional information, call 908-582-4822.

## PhD Fellowship Program (PhD)

The AT&T Bell Laboratories PhD Program is designed to support PhD candidates through completion of their academic and research programs in the fields listed in the center of this brochure. The purpose of the program is to help develop future leaders in selected technical fields important to AT&T and the nation. Participation in this program is by invitation only.

## Engineering Scholarship Program (ESP)

The ESP is designed to encourage selected outstanding minorities and women to pursue a BS degree in Computer Science or the Engineering disciplines listed in the center of this brochure. ESP provides full tuition, a book allowance, fees, room and board, a challenging summer job each year at AT&T and an appropriate mentor. Students interested in applying for one of these scholarships should call 908-582-6461.

## Summer Research Program For Minorities and Women (SRP)

The objective of the SRP is to provide an opportunity for outstanding minorities and women to work for a summer within the research environment of AT&T Bell Laboratories. The program is open to students who have completed 3 years of education in the disciplines listed in the center of this brochure. The program also provides an AT&T Bell Laboratories scientist as a mentor. For additional information call 908-949-1377.

## University Relations Summer Program (UR)

The UR program provides summer employment for outstanding BS, MS and PhD candidates who are college students ranging from sophomore to PhD level seniors and pursuing studies in one of the disciplines listed in the center of this brochure. The purpose of the program is to provide work experience for talented students on a well-defined project in a corporate environment. A mentor is assigned to each student. This program is also open to university faculty members. For additional information call 908-949-9100.

# A Program Description

# of

# *The Young Scholars Program*

# at

# The Ohio State University

Office of Academic Affairs
119 Independence Hall
1923 Neil Avenue Mall
Columbus, OH 43210-1358
(614) 292- 3478

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11/91

## Overview of the Young Scholars Program at The Ohio State University

The Young Scholars Program, based at The Ohio State University, provides academic enrichment and personal support to sixth through twelfth graders from nine low-income urban areas in Ohio: Akron, Canton, Cincinnati, Cleveland, Columbus, Dayton, Toledo, Youngstown, and Lorain (a city where 25% of almost 80,000 residents are Hispanic). The program offers youngsters a multitude of educational and professional experiences to guide them through the challenges of the formative six years preceding high school graduation and enrollment in college.

Each spring, 400 6th graders are inducted into the program. Following completion of the sixth grade, they enroll in their first summer institute on the Ohio State campus and continue participating in year-round activities held in their own cities until high school graduation. At the time that the Young Scholars are selected, they are guaranteed admission to Ohio State with appropriate financial aid, composed of grants and work-study. No loans will be required. In order to receive this package, students must complete all program requirements and finish a college preparatory curriculum with a B average.

*The Goals of the Program*

The primary goals of the Young Scholars Program are to:

1) increase college enrollment and graduation rates of low-income minority and other underrepresented students in Ohio;
2) provide a comprehensive model that other institutions of higher education and school systems, both within Ohio and across the country, can use to adapt their resources to meet the needs of minority students in their communities; and
3) provide the basis for a statewide, state-funded Future Scholars Program in Ohio which is based upon the Young Scholars Program.

The Young Scholars Program also aspires to teach Ohio teachers new concepts and instructional methodologies for use in the summer institute and in their own classrooms. In-service training led by program staff:

- shows teachers new ways to stimulate students to learn mathematics and science;
- heightens their sensitivity to gender and cultural differences in perceptions and performance of science; and
- links them with high school teachers, college and university professors, and mathematics and science educators throughout the state.

*Target Populations*

The Young Scholars Program targets low-income middle and high school students--more specifically, African Americans, Hispanics, and other minority and Appalachian youth --who have shown a demonstrated potential to succeed in college yet are underrepresented at most post-secondary institutions. The program inducts an equal mix of females and males. These youngsters, although usually lacking a parental tradition of attending college, do possess a strong academic background and personal support system. The Young

Scholars Program builds upon the students' existing strengths through extensive academic and social interaction during the formative six years prior to high school graduation, the period when they are most likely to make personal and curriculum choices that are essential to pursuing a college education.

Young Scholars are nominated by teachers, principals, guidance counselors, parents, or even themselves (Until in the 10th grade, new students can enroll as replacements for those who move outside of the programming area or leave the program for other reasons.). The current composition of the Young Scholars enrolled in the program is detailed below. For more information on minority statistics in Ohio as they are affiliated with the Young Scholars Program, see Appendix 1, "Statistical Information: The Young Scholars Program."

| Total Program Enrollment | African American Students | Hispanic Students | Native American | Asian American | Appalachian Students | Other |
|---|---|---|---|---|---|---|
| 134 | 117 | 1 | 1 | 1 | 10 | 3 |
| 96 | 88 | 2 | 0 | 0 | 5 | 0 |
| 224 | 186 | 5 | 3 | 4 | 21 | 0 |
| 255 | 211 | 25 | 1 | 6 | 11 | 1 |
| 242 | 225 | 3 | 1 | 0 | 10 | 1 |
| 128 | 123 | 1 | 1 | 0 | 1 | 1 |
| 56 | 26 | 30 | 0 | 0 | 0 | 0 |
| 134 | 116 | 13 | 3 | 1 | 0 | 0 |
| 121 | 102 | 17 | 1 | 0 | 0 | 0 |

In the spring of 1988, the program's first year in operation, 200 sixth graders from eight metropolitan Ohio cities (Akron, Canton, Cincinnati, Cleveland, Columbus, Dayton, Toledo, and Youngstown) were inducted into the program. During the following year, 400 more sixth grade students were selected from the above cities as well as from Lorain, a northern Ohio city of about 80,000 which has the highest percentage (25%) of Hispanic students from any public school system in the state. Another 800 students were added to the program in 1991 and 1992. Together, these nine cities which participate in the Young Scholars Program have over 75 percent of all minority students in Ohio's public schools. When the first class of Young Scholars graduates from high school in 1994 and the program is at full capacity, over 2,200 students will be participating statewide.

*Description of Program Activities*

Young Scholars are inducted into the program in the spring of their 6th grade and participate in program activities through the completion of 12 grade.

Summer Institute - Their initial involvement with the program occurs in the summer after they are inducted. They attend a two-week summer institute on the Columbus campus of Ohio State where a multitude of academic activities, funded in part by the the U.S. Department of Energy, National Institute of Health, and the National Science Foundation, are offered to expose them to the collegiate experience. The summer institute is extended to three weeks for the Scholars during their last three years in the program.

During the summer institute, students use the same classrooms, science and computer laboratories, library facilities, residence halls, dining halls, student health center, and recreational facilities as university students. Daily classes for the pre-7th to pre-12 graders cover such subjects as critical thinking; study skills; English/ethnic studies; probability and spatial visualization in mathematics; unified sciences; computer skills; the American experience through literature; music and movement; and biological sciences, to name a few. Classes are small, with no more than 17 students to each team of one teacher and one graduate teaching associate.

Young Scholars work with calculators, computers, geometric models, graphs, microscopes and University laboratory equipment. Curricular materials are not remedial. Rather, they are designed to complement, not duplicate, what is taught in the scholars' home schools. They also are required to attend study sessions which are overseen by teaching assistants. They spend over five hours during the summer institute learning basic word processing and graphics in a supervised computer lab. The Young Scholars gain computer experience which increases their analytical skills and technical knowledge, both of which are vital to those preparing for a college education in the '90s and beyond. The Scholars can access these Macintosh and IBM personal computers during additional sessions during free time, evenings, and weekends.

The students also go on field trips into the community, where they experience first-hand what they have previously only read about or seen on television. Some of the activities a recent group of Young Scholars engaged in during a visit to The Ohio State University College of Optometry included using optometric instrumentation to look at the back of the retina (optometry students served as "patients); discussing with professors optical physics of the eyeball lens; dissecting sheep eyeballs to study their anatomy; and talking with students and faculty to learn of the education needed to be an optometrist and of the typical working conditions for optometric professionals.

In-Service Workshops: The entire Young Scholars Program instructional staff, including graduate teaching assistants from all areas of the University, receive intensive, specialized training during in-service workshops prior to during the summer institute sessions. Faculty members from Ohio State and other colleges and universities join with public school teachers to conduct the summer institutes on the Ohio State campus as well as to lead the weekend academic enrichment sessions held in the students' local areas.

Nearly all the college and university faculty who are recruited to teach have had experience teaching or working in a pre-college program. The public school teachers are recruited from the Young Scholars' school districts. They are introduced to a variety of new teaching methods by program staff and faculty in the week prior to teaching at the summer institute. The Young Scholars Program has been highly successful in attracting female and minority instructors to the program. Moreover, most of the summer institute and year-round teaching program staff come from backgrounds similar to the Young Scholars.

Weekend Enrichment Programs: During the school year, Young Scholars participate in enrichment programming located in or near their communities. Weekend academic enrich-

ment sessions, which enable students to review and enhance basic skills, serve as a bridge between the annual summer institutes. Enrichment sessions are conducted by teams of mathematicians, scientists, engineers, or other professionals, most of whom are from local colleges and universities; mathematics and science teachers from the Young Scholars' schools; and teachers from other schools who have taught in summer institutes. Sessions emphasize effective problem-solving skills and in some instances, are combined with career exploration activities and trips to college campuses and business organizations.

Academic assistance: During the school year, between September and May, Young Scholars have access to academic assistance (tutoring) in groups. They work on take-home assignments relevant to their age level and interests, and discuss difficulties they may be experiencing in their classes at school. Either the Scholar, teacher or parent may initiate this assistance at the Scholar's school, or they can contact a program coordinator to put the student in touch with an appropriate teacher who conducts the session. When grades or other factors indicate that the student needs academic assistance, the program coordinator contacts the parent and the scholar to urge such tutoring as well.

Mentors: While many of the students come to the program with strong academic potential, they rarely have a college-educated parent to serve as a role model, or mentor. During the students' second year, the Young Scholars Program strives to match each student with an adult mentor who has similar career interests and, if possible, is of the same gender and race or ethnic heritage. Mentors, who make a two-year commitment, are recruited from community, professional, civic, fraternal, and corporate organizations or educational institutions, for example, the Ohio State University.

Mentors have contact with Scholars several times per month and face-to-face interaction at least once each month. They spend time with Scholars and their parents discussing school activities, study skills, and career exploration. They attend activities of mutual interest with their Young Scholars and may even come to the students' schools on a regular basis to have lunch together or to attend school-related functions. They can offer advice on school and home matters, or simply serve a sounding board for the Scholars to share academic and professional plans.

A major responsibility of the mentors is to point out relationships between academic subjects and work responsibilities. For example, a mentor might explain when it is more time efficient to use memos or computer mail to communicate with co-workers rather than speak to them directly. Visits to the mentors' work place also enable the Scholars to see, first-hand, what job activities are performed by college-educated professionals. With this type of concrete knowledge, Scholars are more apt to change a conceptual view of a specific job description, say *physician*, into a visualization of work environment (local hospital) and duties (interview patient, observe vital signs, order blood tests).

Career exploration field trips: Occurring both during the summer institutes and school year, these excursions acquaint the Young Scholars with diverse careers and encourage them to prepare for jobs of the 21st century. Field trips to local businesses and presentations by area professionals provide opportunities for hands-on learning as well as for observational

learning. At the conclusion of these sessions, students take post-tests to gauge their levels of interest and knowledge in the field.

Young Scholars have visited the corporate headquarters or subsidiary operations of Proctor and Gamble, General Electric, A.T. & T., Cincinnati Bell, Dow Merrill Pharmaceuticals, Cleveland Electric Illuminating Company, William Cargyle Construction, and NASA. They have been exposed to more general career opportunities through visits to local career expositions and the Ohio Cooperative Extension Service.

Cultural events: Visits to area theaters, museums, and the ballet have introduced Scholars to the fine arts, events which most of the students would not have the opportunity to attend otherwise. These non-academic excursions round out the enrichment experience for students while they are on the Ohio State campus and, during the intervening months, in their own communities.

Parents' meetings: The Young Scholars Program considers parent-program interaction as one of the most vital factors leading to program success. It sponsors the *Parent Alliance*, an organization for parents of Young Scholars with chapters in each of the nine participating cities. The *Alliance* increases the Scholars' parents awareness of how to best motivate and assist their children in their educational careers. Meetings bring together parents, the Young Scholars Program staff, university faculty, school officials, teachers, and invited speakers. Through the *Alliance*, parents acquire a better understanding of the educational system's resources and requirements, and have the opportunity to interact with their children's teachers. This interaction strengthens linkages between parents and the schools.

Through *Parent Alliance* meetings, program staff and school officials help parents become more aware of the relationship between a college preparatory high school curriculum and academic performance in college, information about which many of them, not having gone past the 12th grade, would be uninformed. In a broader sense, the *Alliance* enables parents to serve as advocates for their children by giving them an active role in evaluating and contributing to the program.

# *Blacks in Science Program Shatter Stereotype*

By MICHEL MARRIOTT
Special to The New York Times

CATONSVILLE, Md. — On a recent afternoon at the University of Maryland Baltimore County, virtually the only sounds in a classroom came from chalk skipping over a blackboard, scrawling a profusion of mathematical expressions, symbols and formulas.

Many of the 13 students in the class peered up from their notes with preoccupied looks. But for Lance Hester and Gary Young, electrical engineering majors in a special black scholarship program, the blackboard jumble seemed rather standard fare.

"It was pretty much a review; she was just going over the basics," said Mr. Young, a 20-year-old junior, referring to the teacher. "So far it is not too bad."

He and Mr. Hester, 21, are the only blacks in the class. It is their habit to sit in the front so that, in Mr. Young's words, "the teacher will recognize us."

### Exploding Stereotypes

In the last three years, many of this university's professors, administrators and students have come to recognize the tightly knit group of 70 academically talented black students known as Meyerhoff Scholars. Almost from their first days in 1989 on this predominantly white campus of 10,000 students, these scholars began exploding racial stereotypes about blacks' ability to excel in the study of science and technology.

"We've had three years of experience and many of the presuppositions are gone," Michael K. Hooker, the university's president, said of the program. "Now, very often the best student in a science or math or engineering class is going to be a black student. That has brought about a whole cultural change among their fellow white students and among the faculty."

The Meyerhoff program was created in 1988 by Robert Meyerhoff, a white Baltimore philanthropist. His aim was to help a score of academically exceptional black male students who were committed to studying science by giving them extensive financial assistance and academic guidance. Mr. Meyerhoff said he started

Marty Katz for The New York Times

A scholarship program at the University of Maryland Baltimore County has brought together 70 black students interested in science and technology. Known as Meyerhoff Scholars, the group has a cumulative grade point average of 3.4 out of a possible 4.0. Dr. Freeman A. Hrabowski, right, the university's executive vice president, helped start the program in 1989 and oversees the participants.

author of a scientific paper developed during his internship.

"It has been extremely gratifying," said Mr. Meyerhoff, a 68-year-old businessman and engineering graduate of the Massachusetts Insti-

is the university's executive vice president and who helped Mr. Meyerhoff launch the program. "What we see, as we do research on the students, is that the family support has been extraordinarily strong."

in science and technology is slipping at a time when racial and ethnic minorities are projected to become an increasing part of the nation's work force.

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PHOTOS BY TIM FORD

# Meyerhoff Scholars

**To whom much is given, much is required.**

*by Dianne Williams Hayes*

Ahmad Ridley knew of successful African American doctors and lawyers, but when it came to a personal connection with anyone holding a doctorate, no one came to mind.

But that quickly changed when Ridley became a part of the Meyerhoff scholarship program begun in 1988 at the University of Maryland, Baltimore County (UMBC).

As a Meyerhoff scholar, he has met, and been mentored by, many of his heroes and heroines who hold doctorate degrees in the sciences. And now, on his own, he plans to join this select group with a doctorate he can call his own.

The plan to pursue an advanced degree in mathematics seemed like a natural end to Ridley's undergraduate education. Money was always an issue, but the Meyerhoff program ensured that this 4.0 student would be able to do as well in college as he had done in high school without money concerns.

Once Ridley joined what students and faculty refer to as the "Meyerhoff family," his undergraduate courses were supplemented with a summer session at the University of California at Berkeley, where he was able to get the feel of a graduate school environment firsthand.

He has just completed his first year in graduate school.

"When I was applying for the scholars program, I was told that it was expected that we go all the way through," Ridley said. "They put the idea in your head. Before I heard about the program, I wasn't sure what I would do."

### 'Doctor Dad'

Ridley is among the 19 students who com-

*(Above) The first six Meyerhoff scholars graduated in May 1993. The graduates pose with philanthropist Robert Meyerhoff (4th from left) and UMBC President Freeman Hrabowski, III (4th from right).*

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prised the first class of Meyerhoff scholars. They are now in graduate programs at universities that include Princeton, Cornell and the universities of Florida and Pennsylvania.

Over the years, the program has steadily grown to its present number of 150 students; 63 of whom are women.

Kimani Stancil, another scholar, is weighing two scholarships to do his doctoral work in chaos theory at the Massachusetts Institute of Technology. He spent one summer doing research at Bell Labs in New Jersey and another summer at MIT. This summer he will work with lasers at the Kodak laboratory in Rochester, NY.

Stancil credits his solid start to UMBC President Freeman A. Hrabowski III, better known on campus as "Dr. Dad."

Hrabowski, a man on a mission, has traveled across the country to attract the best and the brightest to the academic safe haven that he has created on UMBC's 500-acre campus. He became president in 1993, and is one of only five African-Americans to head a predominantly white public doctoral-research university.

Hrabowski's goal was to attract those high achievers who frequently become discouraged, while attempting to learn, in unwelcoming campus environments. For many who drop out of the sciences or who become so discouraged by their undergraduate experience, graduate school is not a consideration.

*President Freeman A. Hrabowski (in suit) with students at UMBC.*

"We are often asked, 'Why do we attract the high-ability students?,'... but the fact is that the majority of high-ability African Americans who attend predominantly white universities do not graduate in science," Hrabowski said. "Even if students do well in the courses, often they do not feel good about the experience.

"They don't necessarily connect with the faculty members. As a result, they become discouraged and will tend to go to the social sciences or the humanities, where the faculty tends to be more receptive, and where students who can read and write well, regardless of color, can succeed."

Whether or not students are successful in gate-keeping courses, such as chemistry and calculus, can set the tone for their entire experience when courses are sequentially based, and often require collaborative work.

The Meyerhoff program is tackling these concerns by supporting students with tutors, who are backed up by a staff charged with monitoring each student's

*See Meyerhoff, pg. 36, col. 1*

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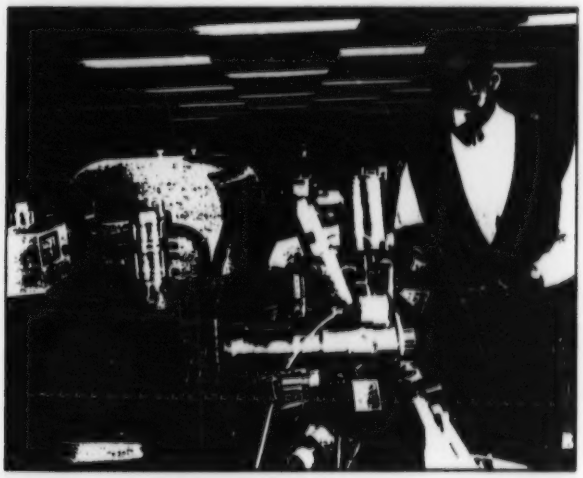

*Freddie McCullough, Meyerhoff scholar, reviews instrumentation at UMBC Center for Structural Biochemistry.*

**Meyerhoff,** *from pg. 35, col. 2*

progress. Much of the program's success is attributed to the energetic man who takes "his Meyerhoff children" to church, to the theater and to his home to ensure that the future holders of doctorates are well-rounded. His energy is contagious, as he discusses the program on every available opportunity.

Hrabrowski became president of the university in 1993, setting a tone for an improved appreciation of diversity. His brag list includes a retention rate among African-American students of 85 percent, while the overall campus retention rate is 83 percent. In addition, outside of the 150 Meyerhoff high achievers, 60 percent of the 1,300 African-American students on campus are in science and engineering. Those students are also encouraged to maintain a high grade-point average and to pursue graduate school.

### *Meyerhoff Roots*

The program, the brainchild of the Baltimore-based Robert and Jane Meyerhoff Foundation, was created to support African American students in science and technology at the baccalaureate level. The scholarships are also supported by the National Aeronautics and Space Administration, Apple Computer Co., American Telephone and Telegraph Co. and the Chevron Oil Co. The Meyerhoff family alone has contributed more than $2 million to a $5 million endowment to establish a permanent fund for African Americans in science.

Initially, the program targeted African American males — whose absence in academia was the most critical, but this policy was changed for the 1990-91 school

# Norfolk State's Dozoretz Scholars

## Black Institution Moves to Boost Blacks in Science

*by Garland L. Thompson*

Synopsis of Norfolk State's Approach

Hypothesis: An increasing pool of talented Black students would choose science careers if they had enough information, resources.

Observation: Black colleges could produce more Black scientists, but need upgraded facilities, curricula.

Plan: Recruit top Black high school grads. Beef up the curriculum. Provide computers, other resources. Cut attrition rate to increase numbers of Blacks entering science and engineering.

Result: Grad schools, professional schools across the country are snapping up Dozoretz scholars.

Jane and Robert Meyerhoff, meet Dr. Ronald Dozoretz. Scholars, take your places. Scientists, stand by your laboratories. The Dozoretz scholars are on the way.

Dozoretz scholars are Norfolk State University's answer to the shortage of Black science and engineering graduates. In 1985, Norfolk State President Harrison B. Wilson and his colleagues had similar ideas to those of Freeman Hrabowski and the Meyerhoff Foundation, with three important variations on the main theme:

- There is an increasing pool of talented Black students who would choose science and engineering careers if they had enough necessary information, early enough, and if they had the resources for the study;
- One way to boost the number of Blacks entering the scientific workforce is to reduce the attrition rate of Black science and engineering majors;
- To attract the brightest Black students, as well as to train them for the highly competitive scientific professions, historically Black colleges and universities (HBCUs), such as Norfolk State, need to beef up their science programs.

Stressing the HBCUs' traditions of role modeling, faculty encouragement, mentoring and nurturing, the program at 8,700-student Norfolk State began with the thesis that Black colleges are "best equipped and motivated to do the job." Wilson persuaded Ronald Dozoretz, a Virginia psychiatrist, to put up the initial $250,000 funding for the Dozoretz National Institute for Minorities in Applied Science.

### *Recruitment Requirements*

The Institute is a scholarship program in Norfolk State's School of Health Related Professions and Natural Sciences. Intended to provide "the best possible education in the sciences for highly qualified and motivated Black students," the Institute recruits all over the country and oversees all aspects of students' training.

Each year, Norfolk State launches a regional campaign to recruit top minority high school seniors, using the contacts of its admissions

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year. Initially, the Meyerhoff scholars proudly wore white shirts and ties each day to set them apart, and to counter the stereotypes about the African American male. These days, the special uniforms are gone and the male and female Meyerhoff scholars dress like the rest of the student body, but they still stand out academically.

"I told them they'd be more popular than the basketball players," Hrabowski said. "We wanted our African American scholars to be viewed with great esteem and great admiration.

"It still isn't cool to be smart. When you see a group of Blacks together, too often they are not talking about the academic work. But on this campus, whether it's a group of Asians, or a group of Blacks or whites, they tend to be talking about the academic work."

Meyerhoff scholars receive tuition, room and board, a personal computer, an annual stipend, summer internships and contacts with professional mentors. However, the students are required to give

*See Meyerhoff, pg. 38, col. 1*

office and alumni and local school teachers, counselors and principals. Some 98 percent of students accepted rank in their high school classes' top 10 percent.

About 80 percent of Dozoretz scholars come from Virginia high schools. The rest are from 12 other states and the District of Columbia. Norfolk State Vice President Jesse Lewis says the university once sent flyers announcing the program to high schools across the country, but now, "we don't need to advertise any more. We're getting applications from young people at schools we never sent anything to."

Dozoretz scholars must be U.S. citizens and members of "those ethnic minorities which are underrepresented in science and engineering." Each candidate must meet stiff criteria:

- Grade-point average of at least 3.0 on a 4-point scale, as well as high SAT or equivalent ACT scores;
- Three exceptional recommendations from a principal or counselor, a science or math teacher and another person in the student's community such as a doctor or minister;
- A 300-word essay describing career goals and plans; and an
- Interview by a special selection committee.

Each Dozoretz scholar receives an award of up to $8,000 a year (depending on residency status) covering tuition, fees, room, board and books. Each also gets a microcomputer for use during the college career. Dozoretz scholars are "honors" science majors and pursue a special, rigorous curriculum to prepare for careers in biology, chemistry, computer science, electronics engineering, mathematics or physics. They must maintain 3.0 grade-point averages, with no grades below C.

In addition to basic and advanced science courses, Dozoretz scholars take special Institute courses. After the sophomore year, each scholar begins an internship or cooperative education experience, which may continue after the junior year. Seniors work for at least a semester on research projects at

*See Scholars, pg. 40, col. 1*

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Special Report

**Meyerhoff,** *from pg. 37, col. 1*

something back. Students serve as mentors to inner-city youth, in hopes of planting the seeds for future scholars.

The theme of the program, Hrabowski said, matches the biblical admonition that to whom much is given, much is required.

Before the fall semester begins, scholars are required to spend their summer on campus taking courses in math and science and African American culture.

"We're producing whole people, and they need to understand their history and their literature," Hrabowski said. "We want them to take pride in what we've been able to accomplish."

### *National Shortage*

The bleak national statistics demonstrate the need for coordinated efforts to address the problem of the low number of doctorates awarded African Americans in science and engineering. In 1992, there were 896 doctorates awarded in physics, but only seven went to African Americans, according to the National Research Council. There were four African-Americans with doctorates in mathematics, five in computer science and only 49 in all engineering fields.

Private corporations have admitted to having a vested interest in addressing this problem. For example, AT&T has helped 67 students earn doctorates by paying their graduate tuition, giving them a $13,200 annual stipend and offering summer employment. In addition, they are paired with mentors.

The National Institutes of Health will spend more than $60 million this year on research and training opportunities for minority college students. And the Pew Charitable Trust put $3.5 million into a new program designed to attract 200 students a year into doctoral programs.

The National Science Foundation (NSF) has a number of national efforts underway, including the Research Careers for Minority Scholars program, in which selected students receive scholarships and gain research experience with leading researchers.

In addition, the Alliance for Minority Participation program brings together universities and corporations as part of a systemic effort designed to detect problem areas in the doctorate pipeline. The large-scale effort, begun in 1990, now includes 15 alliances which involves 200,000 minority students who are taking courses in math, science and technology.

"We have to build up the pipeline," said Dr. Roosevelt Calbert, director of the NSF Human Resource department. "We are concerned about the issues on the pre-college level. Once we get them in, we want to shore up retention and give them a quality education with research experience."

### *Solutions*

The Meyerhoff program is one of many around the country designed to fill the pipeline with more students who are academically prepared and have an interest in obtaining an advanced degree.

"Unlike hundreds of programs, we can document that we've got literally hundreds of students now earning A's and B's in upper-level science and math courses," Hrabowski said. "That's unusual at a predominantly white institution. It's happening because of the strong sense of community we have developed in the program."

Many larger universities are forming partnerships with historically Black colleges and universities in order to expose upper-level students to graduate work, in


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the hope that they will make graduate school a priority. The following are a small sampling of some of the programs in place nationwide:

• **University of California at Berkeley** — *The Summer Undergraduate Program for Engineering Research at Berkeley (SUPERB)*, started in 1990 by a group of African American students who sought to increase the skills and flow of African American graduate students. SUPERB trains underrepresented scholars in research design, methodology, presentation and report writing; all tools which augment the skills necessary for graduate school success.

• **Massachusetts Institute of Technology** — *The MIT Summer Research Program* is an effort to identify talented sophomores and juniors from around the country who may benefit from a summer on MIT's campus by working in research laboratories under the guidance of experienced scientists and engineers. The goal is to help students to be prepared and motivated for doctoral programs.

• **University of Notre Dame** — *The National Consortium for Graduate Degrees for Minorities in Engineering and Science, Inc. (GEM)*, a non-profit organization that resulted from a major collaborative effort in the mid-1970s among universities and research laboratories concerned with the underrepresentation of ethnic minorities. The program offers fellowships to students to attend member universities for work on master's and doctorate in engineering. In 1994, GEM offered 215 fellowships for students pursuing a master's; 24 for doctorate studies in engineering; and 28 fellowships for work toward a doctorate in science.

According to Adams, the solutions lie in choice and access to graduate programs, financial support for full-time participation and nurturing faculty members.

### The Future

The need for programs to fill the doctorate pipeline with more qualified African Americans has been well documented, but what is already becoming abundantly clear is that even with the best efforts from programs like the Meyerhoff scholars, the flow through the pipeline will not be much more than a trickle, if efforts do not include reaching students earlier, with better math and science curricula.

Doing so means retraining teachers to be able to inspire an interest in science, and to learn to motivate more than the few students who easily stand out.

The Chicago public school system has started a massive new experiment which includes Nobel Prize-winning physicist Leon Lederman, who has helped to create the Teachers Academy for Math and Science, which has trained 700 elementary school teachers during 16 weeks of intensive training in math and science.

Teachers are provided extensive classroom follow-up and access to a resource center at the Illinois Institute of Technology, where teachers meet with scientists and get resource materials to take back to the classroom.

Educators throughout the country are conceding that the pipeline must be broadened in order to make a difference. Programs such as The Meyerhoff scholars can provide the necessary bridge from undergraduate to graduate school, but the pool of candidates to make a difference down the line are now those who must be motivated in elementary school.

"These students represent our national treasure," Hrabowski said. "It's about building a sense of community among students who are talking about what it means to be a high-achieving African American." ■


**NARCE**
**The National Alliance of Research Centers of Excellence**

***Dedicated to training tomorrow's science and engineering leaders.***

**NARCE** is the National Alliance of Research Centers of Excellence, an association of eight unique research programs funded through the National Science Foundation's Minority Research Center of Excellence (MRCE) program. The MRCE program was established in 1987 to promote exemplary science and engineering research and to increase the number of scientists and engineers trained to conduct high level research.

**NARCE's** purpose is to:

♦ Publicize the educational opportunities and cutting-edge research advances at the MRCE's ♦ Develop and implement activities that attract and advance minorities in science and engineering ♦ Identify and promote mechanisms for alliances and partnerships with other universities, private foundations, and industry ♦ Ensure that MRCE programs receive the support needed to continue to encourage minority contributions to the scientific and technological life of the United States into the 21st century.

**NARCE's** national headquarters and clearinghouse are located at The City College of New York. For further information about opportunities for graduate study and/or research collaboration, please contact the appropriate MRCE Center Director listed below.

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Special Report

**Scholars,** *from pg. 37, col. 1*

Norfolk State or as research assistant/trainees at private or government research laboratories.

Vice President Lewis says many scholars wind up working with faculty members at the Energy Department's Continuous Electron Beam Accelerator Facility (CEBAF), near Norfolk. He says a new agreement boosts the number of Norfolk State faculty at CEBAF, which is likely to increase opportunities for Dozoretz scholars as well.

A major focus is the use of computers and other instruments in science. The students learn routine uses of microcomputers, beginning in a two-week summer workshop before their freshman year. Computers are installed in scholars' dorm rooms, and computer-aided instruction is used extensively in coursework. They study computer languages, do special assignments, study computer interfacing in science labs and use word-processing and computer tutorials for their courses.

Scholars also take a special course in scientific instrumentation during their sophomore or junior year. Norfolk State materials say it "integrates the concepts of physics, chemistry, biology, computer science and electronics into a comprehensive practical experience."

Norfolk State has internships or cooperative education agreements with the National Bureau of Standards, NASA and the University of Illinois. Dozoretz scholars pursue summer internships at NASA's Langley Research Center; the Medical College of Hampton Roads; Kennedy Space Center; Norfolk State's own research labs; AT&T Bell Laboratories' Chicago facility; medical schools at the University of Pittsburgh, the universities of Tennessee and Illinois; Virginia Power Company and the Massachusetts Institute of Technology.

A cooperative program with Eastern Virginia Medical School, begun in 1987, provides guaranteed admission to medical school for three members of each Dozoretz class. Recommended Dozoretz scholars participate in special preparatory programs at the medical school during their undergraduate years and, after compiling grade-point averages of 3.3 or better, are automatically admitted to Eastern Virginia.

The Institute began with an initial grant from Dozoretz, but now is funded by appropriations from the Virginia General Assembly and private donations. Among others, it won a $300,000 grant from the David Lucille Packard Foundation to enhance its science curricula.

The Institute claims an 85-percent retention rate. The first Dozoretz class graduated in 1990. The 11 graduates all went to graduate or professional schools at Georgia Tech; the universities of Virginia and Minnesota; Eastern Virginia Medical School; Virginia Commonwealth University Dental School; the University of the Philippines; and Pennsylvania State University.

The 1991 class of 22 went on to 19 graduate and professional institutions, including: the University of Pennsylvania; Harvard University; University of Alabama; Stevens Technical Institute; East Carolina School of Medicine; Temple University; Old Dominion University; University of South Carolina; University of Notre Dame; University of Wisconsin - Madison; University of Alaska; Washington University; and Johns Hopkins University.

The 1992 class produced 10 graduates. Lewis said the Dozoretz program accepts about 25 students into each entering class, since Norfolk State intends to keep the total enrolled at 100. Competition from other institutions sometimes cuts the number actually enrolled in a given class, however. Thus, the 1993 class had 25 graduates and 1994's class had 10. The first class of Dozoretz Ph.D.s and M.D.s graduated this year. ■


OPPORTUNITIES FOR MINORITY STUDENTS

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OXFORD, OHIO

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Miami University, a state-assisted liberal arts university in southwestern Ohio, offers a variety of programs leading to the master's, specialist, and doctoral degrees. The Graduate School has more than 58 programs in 36 departments, in both research and practice-oriented fields.

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*FOR INFORMATION, WRITE OR CALL:*
Dr. Cheryl Burgan Evans, Associate Dean, The Graduate School, 102 Roudebush Hall, Miami University, Oxford, OH 45056; (513) 529-4125. FAX: (513) 529-3762.

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# MENTORING

**CUNY**

Robert Cunningham Chambers Program with Professor Pearl Kamer

The MAGNET program recognizes that mentoring—the encouraging voice of a more experienced professor or peer—can often make the difference in a doctoral student's success. Each first-year MAGNET is called monthly by a postdoctoral fellow offering feedback, reassurance, reminders, and perspective. Postdocs who are in the same field as their first-year mentoring partners often provide even more concrete help in the form of books, tutoring, or pointers on the landscape of their particular program. At roundtables and purely social occasions the Fellows have another chance to attend to each other's difficulties and achievements.

> *"There's a lot to know inside the field—how to time your dissertation, how to use the resources of The Graduate School, how to focus research. It's good to have somebody in your program to help." — Linwood Lewis*

By working closely with the Executive Officers and faculty of each program, by introducing students to minority faculty, and by generally stressing the importance of mentors, MAGNET also encourages students to find that faculty member who will take a close interest in their personal and professional development. The administrators of the MAGNET program also play a role. As Matthew Schoengood, Executive Director for Student Services, puts it, MAGNET reminds students that there's always someone they can call. MAGNET supports mentoring—people helping people.





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*TOP:* Dissertation Year Fellow Linwood Lewis (Psychology) meeting with faculty mentor Pamela Trotman Reid. *MIDDLE:* Four-Year Fellows Shelley Deosoran (Chemistry) and Nadeen Thomas (Anthropology) flanking postdoctoral mentor Claude-Earl Brathwaite (Chemistry). *BOTTOM:* Four-Year Fellow Robert Craig (Chemistry) in the lab with faculty mentor John Lombardi

# The McNair Messenger

The Official Newsletter of the McNair Scholars Program at the University of Maryland Baltimore County

Spring 1995 Volume 2 Issue 1

1995 - 96 Scholars Selected

## 1995 - 1996 Scholars

*The third class of McNair Scholars has been selected and their program activities began in January. The program is designed to enhance their research skills and success in graduate school. To kick off the year's activities the group sojourned to Annapolis where they received an introduction to Maryland history and the State legislature. They were formally introduced in the House of Delegates and met with members of the Legislative Black Caucus. After surveying research sources in the Department of Legislative Reference, they visited the Maryland State Archives where they were introduced to research using state records spanning a variety of subjects from legislative materials, to records of health service providers, to birth, death and land records. In March the group traveled to New York City where they were introduced to special collections as a research source. They were briefed on research materials at the Schomburg Research Center and visited the Metropolitan Museum of Art. In addition, their on-campus activities include courses on writing scholarly research proposals and library methodology.*

| Scholar | Major |
|---|---|
| Karen Abraham | Bio-Chemistry |
| Gwen Blackwell | Chemical Engineering |
| Rondrea Bobo | Psychology |
| Tiffany Booker | Health Science Policy |
| Naima Carter | Chemical Engineering |
| Nikolai Nadal | Political Science |
| Nadine Dumore | Psychology |
| Yolanda Gaines | Bio-Psychology |
| Gerry Gilstrop | Pre-Pharmacy |
| Jeffery Gross | Biological Sciences |
| Dedrick Henry | Computer Science |
| Jennifer Himmer | Emergency Health Srvs |
| Christa King | Political Sciences |
| Meisha McGuire | Interdisciplinary Studies |
| Kalimah McRae | Psychology |
| Mitchell Ng | Information Systems |
| Funmi Ogundele | Biological Sciences |
| Wadena Ridgell-Nalle | Sociology / Psychology |
| Eric Smothers | Sociology |
| Damita Strong | Information Systems |
| Sherri Taylor | Interdisciplinary Studies |
| Michael Wright Jr. | Psychology |
| Kindra Marshall | Psychology |

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